

MAY 15, 1961

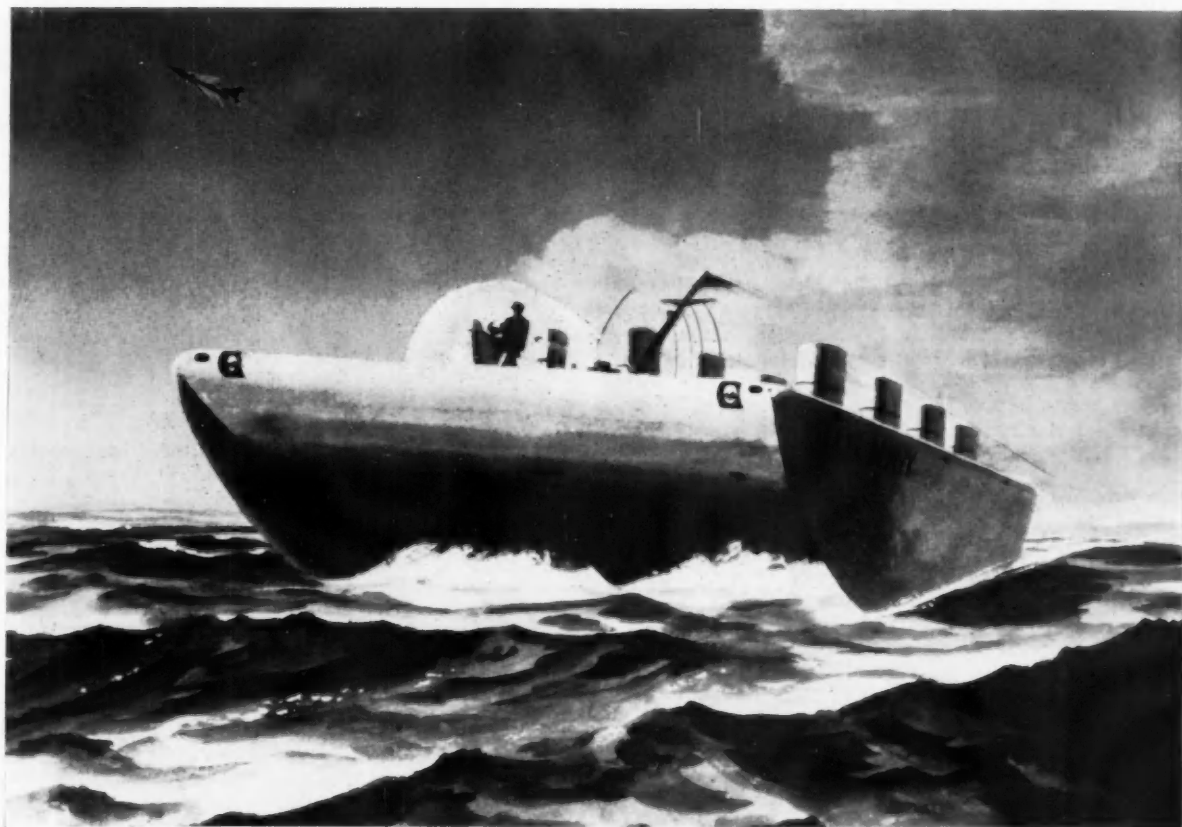
# AUTOMOTIVE INDUSTRIES

ENGINEERING • MANAGEMENT • PRODUCTION • DESIGN

A CHILTON PUBLICATION

## DREYFUSS DESIGNS

A STUDY OF THE NEW JOHN DEERE TRACTORS . . . Page 72



**Exclusive:**

Unique "Hydro-skimmer" above, shown for first time in artist's conception. First hydro-skimmer to be built by the Navy will use gas turbines as prime movers. Craft is supported by cushion of high volume low pressure air.

**SEE PAGE 41**

**ALSO IN THIS ISSUE . . .**

PLASTICS USES SPURRED BY SPI  
A METHOD FOR PROJECT MANAGEMENT  
GAS TURBINES FOR AUTOMOTIVE USE



# BORE AND FACE GRINDING...

## Two Chuckings or One?

by Charles H. Hall  
Chief Grinding Engineer  
The Heald Machine Company

Many parts that call for an internal grinding operation also require precision finishing on an adjacent or associated face. This poses no particular problem, of course, and it usually presents an opportunity to make substantial savings by combining the two operations on a single machine.

The conventional method of grinding the bore on one machine and the face on another has some inherent disadvantages. It means two separate loading and grinding operations plus additional handling between machines. And since two chuckings are involved, the relationship between bore and face is subject to squareness variations which may or may not be serious.

If, on the other hand, the bore and face can be done at a single chucking, total floor-to-floor time can be greatly reduced. But even more important is the fact that squareness between bore and face can be positively assured.

Combined bore and face grinding has been standard procedure with certain types of work on Heald two-spindle internals for many years. Several different methods can be employed, each of which has its own merits for a particular application.

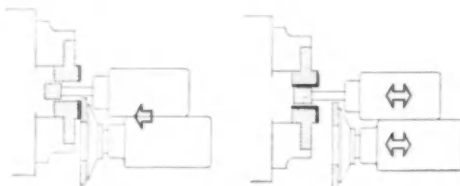
Where cycle time must be kept to the minimum, slide-bar facing offers maximum efficiency and economy, for both surfaces are ground *simultaneously*. One wheelhead unit mounted on anti-friction slide bars holds the facing wheel in grinding position while a second wheelhead unit reciprocate grinds the bore.

Where high production requirements are not a limiting factor, initial machine cost can be lowered by using a two-spindle machine arranged for sequential bore and face grinding, either with or without indexing of the wheelheads. Where bore tolerances are extremely close and indexing is not desired, fixed wheelheads can be arranged to permit

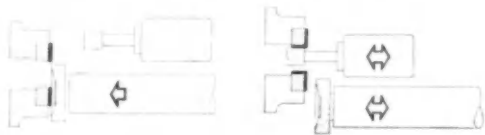
manual plunge facing while the bore wheel enters the work without touching it. The table is then backed off to reciprocate-grind the bore.

Where indexing is permissible, a retractable facing head is often used. After the work is plunge faced, the facing head is retracted and table is indexed to align the bore wheelhead unit with the hole. This arrangement provides maximum versatility and permits the machine to be used as a bore grinder, a face grinder, or a combination of both.

Whatever your requirements for bore and face grinding, it is probable that one of these two-spindle arrangements can be applied with a substantial reduction of initial investment, lower floor-to-floor cycle time and an improvement in quality as well.



Diagrams of sequential bore and face grinding with fixed wheelheads, showing face grinding at left and bore grinding at right.



Diagrams of sequential bore and face grinding with retractable facing head and cross slide indexing, showing face grinding at left and bore grinding at right.



Diagrams of slide-bar facing arrangement showing semi-finish bore grinding and face grinding at left and finish bore grinding at right.

**THE HEALD MACHINE COMPANY**

Subsidiary of The Cincinnati Milling Machine Co.  
WORCESTER 6, MASSACHUSETTS

Circle 101 on Inquiry Card for more data



## KNOW YOUR ALLOY STEELS . . .

*This is one of a series of advertisements dealing with basic facts about alloy steels. Though much of the information is elementary, we believe it will be of interest to many who may find it useful to review fundamentals from time to time.*



for Strength  
... Economy  
... Versatility

## Flame-Hardening Alloy Steels

The process known as flame-hardening involves the direct application of flame to the surface of steel, heating it above the transformation range, then hardening it by quenching. The primary purpose of this process is to achieve surface-hardness without affecting core properties. Jets of flame are played directly on the steel, and hardness penetration can be made to vary considerably. In alloy steels this depth will range usually from 0.03 to 0.12 in., the actual figure depending upon the method of heating and quenching used.

Unlike carburizing, flame-hardening does not involve the absorption of extraneous elements by the steel. There is no alteration of the chemical composition. To put it simply, the steel must have its own self-hardening characteristics; it cannot be dependent upon carbonaceous salt baths, gases, and other media.

Flame-hardening is not a substitute for the conventional furnace method. Each has its uses. The particular virtue of flame-hardening is that the flames can be directed to localized areas. The furnace, on the other hand, is generally more economical and feasible when parts produced in large quantities must be hardened all over.

Any type of hardenable steel, alloy or carbon, can be flame-hard-

ened, and there will usually be no scale or pitting. The alloy content is the governing factor when determining the quench. In some cases a rapid quench is required; in others, it can be as slow as air-cooling. Tempering presents no problems, for flame-hardened steel can be tempered as if hardened to the same degree by other methods.

A list of typical flame-hardened parts includes such familiar items as gear and sprocket teeth, and certain types of cams and rollers, and shoe treads. A complete list would include many other parts that often require a localized hardening treatment, especially for wear-resistance.

When you need information about flame-hardening methods, please feel free to consult with our technical staff. Bethlehem metallurgists will work with you, at no obligation, and you can depend on their suggestions. You can rely on Bethlehem, too, as a source of alloy steels . . . for Bethlehem makes the complete range of AISI standard grades, as well as special-analysis steels, and all carbon grades.

*This series of alloy steel advertisements is now available as a compact booklet, "Quick Facts about Alloy Steels." If you would like a free copy, please address your request to Publications Department, Bethlehem Steel Company, Bethlehem, Pa.*

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See how B&W Lectrosonic tubing can meet your hydraulic line requirements. Just call your B&W District Sales Office or write for Bulletin T-435. The Babcock & Wilcox Company, Tubular Products Division, Beaver Falls, Pennsylvania.



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# AUTOMOTIVE INDUSTRIES

A CHILTON MAGAZINE • PUBLISHED SEMI-MONTHLY

MAY 15, 1961

Passenger Cars • Trucks • Buses • Aircraft • Tractors  
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Farm Machinery • Parts and Components • Accessories  
• Production and Processing Equipment •  
Design • Production • Engineering • Management

VOL. 124 No. 10

## Features • • •

### ▼ Automotive Plastics Uses Spurred by SPI

The versatility of plastics and the wide range of properties now available to the engineer and designer have led to the increased use of plastics in automobiles. Today we see more than 20 lb of plastic materials used in the average car. Page 61

### ▼ Rubber Tires Find Wide Application in Construction Equipment

The demand for wheel loaders in the construction equipment industry started during 1958 when their sales increased more than 25 per cent. In addition, contractors have found increasing use for wheeled tractors. Page 69

### ▼ Industrial Design a Vital Ingredient

Six years ago the decision was made to produce a completely new line of John Deere tractors. Nineteen tractor models, and allied equipment, have been put into production since that time. William F. H. Purcell, partner of Henry Dreyfuss, describes the handling of this project. Page 72

### ▼ A Method for Project Management

This article presents a suggested method for project management that can be adapted for any project. It has been used in innumerable diverse activities. Page 80

### ▼ Gas Turbines for Automotive Use

To be seriously considered as a competitor for the reciprocating automotive engines in use today, a competing powerplant will have to prove itself to be lighter in weight and smaller in size for the same power, able to deliver better performance, and to save on fuel and upkeep. Most of these merits are claimed for the gas turbine. Page 82

### ▼ Preview of the Design Engineering Show

Cobo Hall, in Detroit, will host the 1961 Design Engineering Show and Conference, May 22 to 25. This will mark the first time that the event has been held in the Motor City. The opening conference will be devoted entirely to design engineering in the automotive industry. Page 91

### ▼ Spheroidizing of Heading Stock

The Chicago Screw Co., Division of Standard Screw Co., has in operation a continuous pusher-type furnace for spheroidizing coiled stock used for cold-headed fasteners. Page 120

### ▼ 27 New Product Items and Other Features Such as:

Machinery News; Manufacturers' News; Industry Statistics; and On Our Washington Wire

... continued on next page

MEMBER

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BPA

Business Publications Audit of Circulation

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*Low-cost way to reliability in weatherseals...*

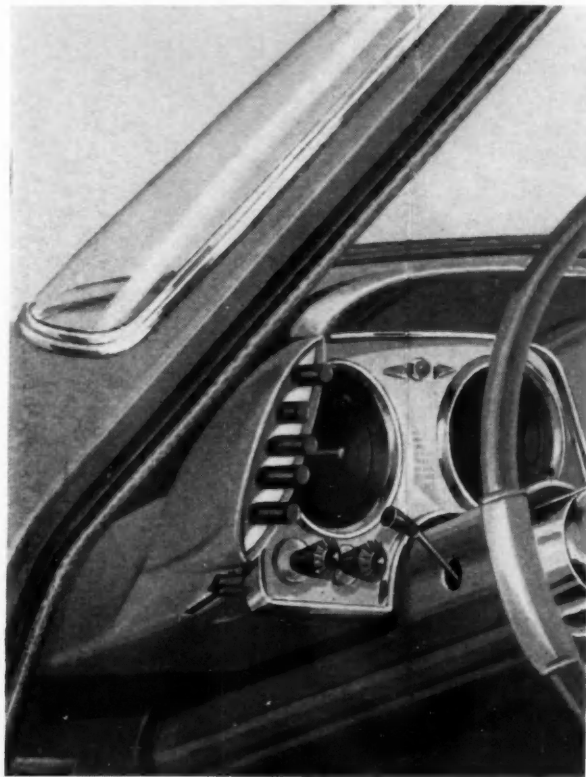
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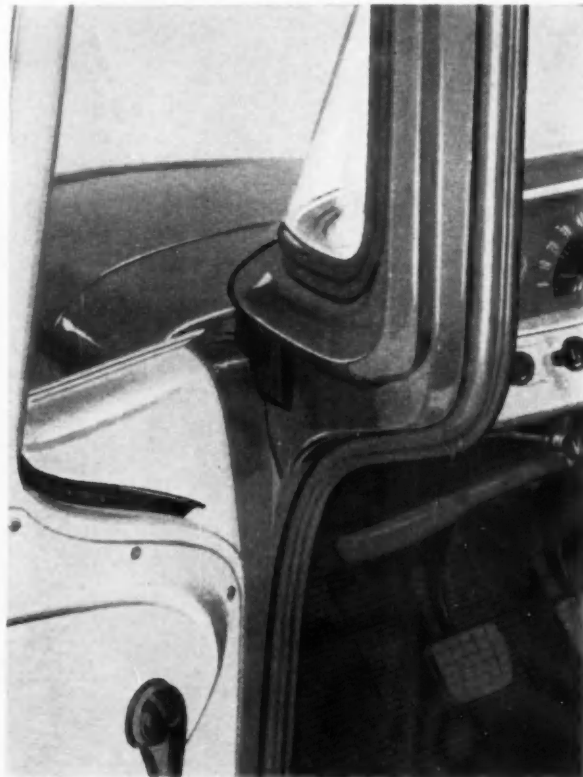
In addition, closed-cell extrusions of neoprene sponge offer you these important advantages: *new design freedom* because extruded seals permit a variety of complex cross sections including hollow

bulbs; *low tooling costs* because inexpensive extrusion dies replace costly molds; *low water absorption* because their characteristic closed-cell structure virtually eliminates water penetration.

That's why manufacturers in growing numbers now specify neoprene closed-cell extrusions to prevent leakage, assure dependably weathertight seals in cars, station wagons, trucks. For information write: E. I. du Pont de Nemours & Co. (Inc.), Elastomer Chemicals Dept. AI-5, Wilmington 98, Delaware.



Doors on this fast-selling compact are kept weathertight by a new type of weatherstripping made of extruded closed-cell neoprene sponge. Door seal and windlace are combined in a single piece, resulting in significantly lower production costs.



On this popular line of trucks, unique "self skin" of extruded neoprene sponge permits tighter radius bends to be made without wrinkling. Other applications for this new body sealing material: deck lid seals, roof rail seals, hood lacing, gaskets.



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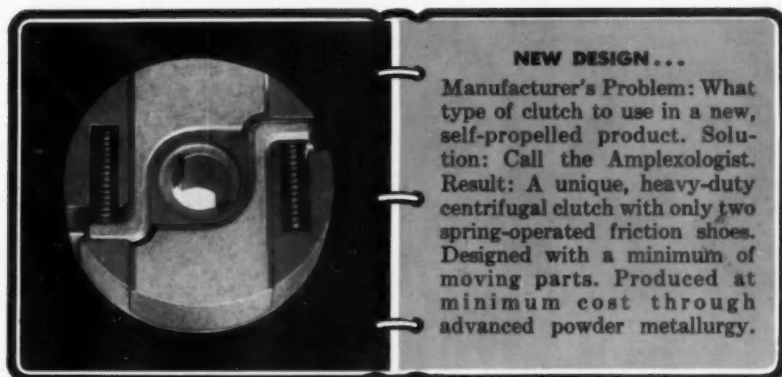


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## CALENDAR

### OF COMING SHOWS AND MEETINGS

- Society for Non-Destructive Testing, North East Regional Convention, Montreal, Que.....May 17-19
- Fluid Controls Institute, Inc., 1961 Annual Meeting, Sea Island, Georgia .....May 21-23
- Industrial Heating Equipment Association, Annual Spring Meeting, Hot Springs, Va. ....May 21-24
- Design Engineering Show and Conference, Detroit .....May 22-25
- American Society of Tool & Manufacturing Engineers, 1961 Engineering Conference & Exhibit, New York .....May 22-26
- American Iron and Steel Institute, Annual Meeting, New York City May 24-25
- National Machine Tool Builders' Association, 59th Spring Meeting, Washington .....June 1
- American Gear Manufacturers Association, Annual Meeting, Hot Springs, Va. ....June 5-7
- Instrument Society of America, Instrument-Automation Conference & Exhibit, Pittsburgh .....June 5-8
- Society of Automotive Engineers, Summer Meeting, St. Louis ...June 5-9
- The Society of the Plastics Industries, Inc., 9th Annual Plastics Exposition, New York City....June 5-9
- Malleable Founders Society, Annual Meeting, Colorado Springs, Colorado .....June 8-9
- American Society of Mechanical Engineers, Annual Summer Meeting, Los Angeles .....June 11-15
- Seminars in Industrial Engineering, Cornell University, Ithaca, N. Y. June 13-16
- American Society of Mechanical Engineers, Applied Mechanics Conference, Illinois Institute of Technology, Chicago .....June 14-16
- Drop Forging Association, Annual Meeting, White Sulphur Springs, W. Va. ....June 14-17
- National Association of Metal Finishers, Annual Convention, Boston .....June 16-19
- Material Handling Institute, Great Lakes Show, Detroit .....June 19-21
- Massachusetts Institute of Technology, Scientific and Engineering Reports, Cambridge, Mass....June 19-23
- American Society for Testing Materials, Annual Meeting, Atlantic City, N. J. ....June 25-30
- American Vacuum Society, 5th Annual Conference on Vacuum Metallurgy, Heights Campus, New York U. ....June 26-27
- 1st International Truck, Trailer and Equipment Show, California Trucking Association, San Francisco .....June 28-30
- 2nd Joint Automatic Control Conference, Sponsored by: ISA, AIChE, AIEE, ASME, IRE, University of Colorado, Boulder, Colo. ....June 28-30



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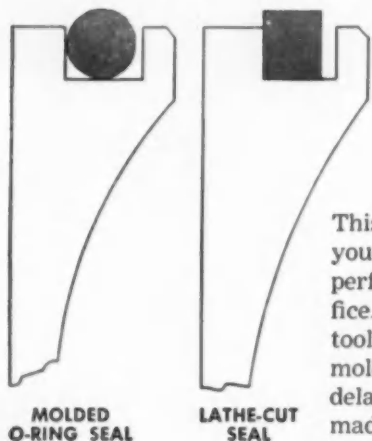
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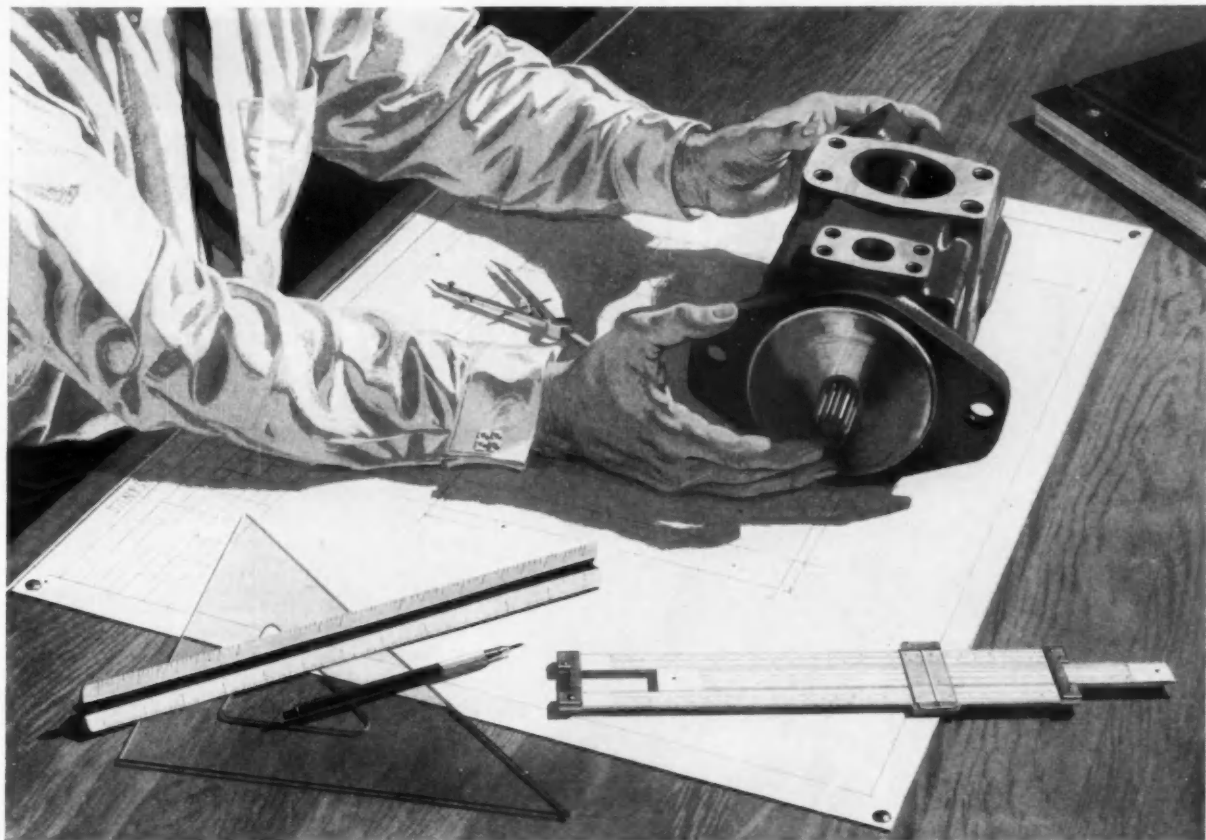


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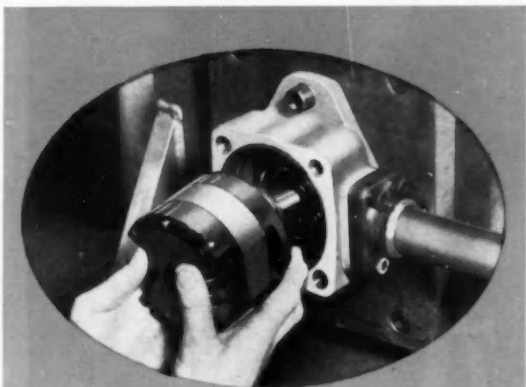
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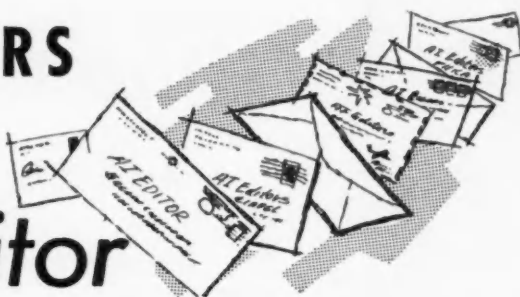
Owosso, Michigan



# LETTERS

to the

# Editor



Readers' opinions or requests for additional information on material appearing in the editorial pages of **AUTOMOTIVE INDUSTRIES** are invited for this column. No unsigned letters will be considered, but names will be withheld on request. Address *Letters to the Editor*, **AUTOMOTIVE INDUSTRIES**, 56th & Chestnut Sts., Philadelphia 39, Pa.

## TECHNICAL DATA SHEETS

General Motors Overseas Operations would appreciate five complete file sets of your technical data sheet service. These sets of material should be forwarded to the attention of Mr. Drew. They in turn will be shipped to our overseas operations in Germany, England, Australia, Brazil and Argentina.

It is most kind of you to provide this service and I am sure that our overseas divisions will find this service most useful.

**N. H. McCuen**  
Asst. Chief Engineer  
General Motors Overseas Operations  
Detroit, Mich.

I have recently received the first set of Technical Data Sheets along with a copy of the Design Improvement Planning Chart.

I am pleased to report that these Data Sheets are both interesting and informative, and provide a ready-reference file in compact form.

They will certainly be a helpful aid in keeping us informed of the latest developments in the automotive field. They will be especially appreciated by our division which is concerned with new engine design.

I would also like to thank you for including my name on your mailing list for the Technical Data Sheets.

**A. C. Capparelli**  
New Design Supervisor  
Engine Design Dept.  
Mack Trucks, Inc.  
Plainfield, N. J.

Relative to your Design Engineering Improvement Planning Service, we are interested in chassis suspension systems for passen-

ger cars and light trucks.

We would appreciate past statistical issues for 1960 and earlier years and any additional data you may be able to provide.

**Gary Weisenthal**  
Plant Engineer  
Faber Industries, Inc.  
Detroit, Mich.

## QUALITY CONTROL

The copies of your Quality Control Manual arrived while I was out of town and they are very much appreciated. This should be a useful document to Automotive Quality Control people and should attract some interest in the Automotive Division.

**O. F. Keeler**  
Past Chairman  
Automotive Division  
A. S. Q. C.

## HYDROSTATIC DRIVE

Please send two (2) copies of April 1 issue of **AUTOMOTIVE INDUSTRIES** containing the article "Auxiliary Propelled Howitzer Has Hydrostatic Drive."

**Arnold A. Kester**  
Chief, Design Engineering  
Rock Island Arsenal  
Rock Island, Ill.

## REFERENCE

I am in the final stages of revising the 4th edition of *Industrial Organization and Management*, published by McGraw-Hill Book Company, and would like your kind permission to use the attached reference.

**Lawrence L. Bethel**  
President  
Fashion Institute of Technology  
New York, N. Y.

● Permission granted—Ed.

# FOR SUPER SERVICE ON QUALITY FASTENERS



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When you are faced with an immediate need for super service to keep production at top speed, Southern fills the bill. Whether it's an air shipment from Southern's factory, or a rush order from one of our four warehouse locations, Southern's service, like Southern quality, has earned an enviable reputation for dependability.

Send your order or request for current Stock List to Southern Screw Company, P. O. Box 1360, Statesville, N. C.

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**K. FALCK-PEDERSEN** tells  
how Lindberg equipment  
helps produce gears for  
high-pressure pumps



*Mr. K. Falck-Pedersen, Chief Engineer, Commercial  
Shearing and Stamping Company, Youngstown, Ohio.*

"The Lindberg heat-treating furnaces and atmosphere generating equipment installed in our Youngstown plant two and one-half years ago provided a fine solution to a big problem of ours. The units now give us complete and precise control over hardening and treating of gears for our high-pressure pumps. During these years, the equipment has proven trouble-free, required little maintenance and has proved to be remarkably easy to operate."

**COMMERCIAL**  
*shearing & stamping*

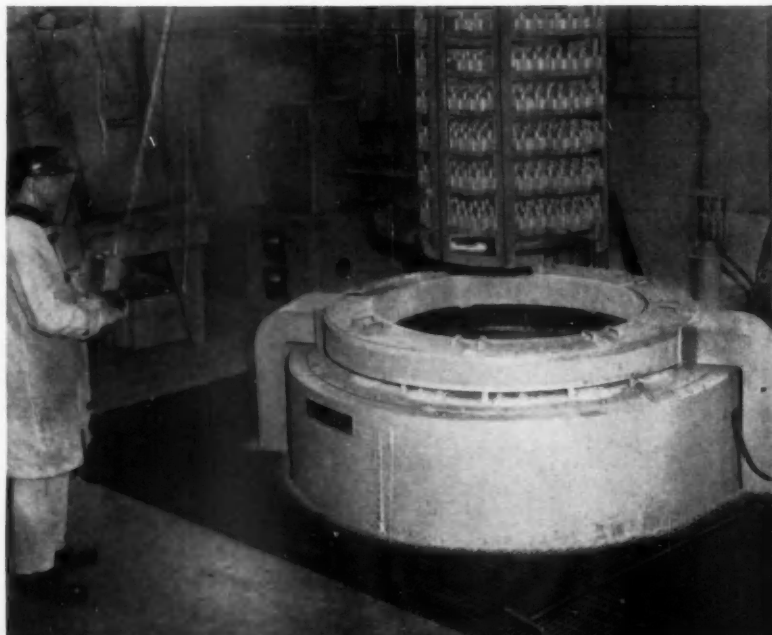
Lindberg equipment at Commercial is used for carburizing gears for high-pressure pumps and allows mass production of practically distortion-free gears, while holding the degree of hardness as well as depth of case to very close tolerances—load after load after load. The installation includes one electric and two gas-fired furnaces, Lindberg Hyen Atmosphere Generator and Carbotrol.

If you have a problem in heat treating, why not get the Lindberg representative's help now? You can depend on his experience and Lindberg's engineering and design know-how to provide exactly the right equipment for your need. And it's easy, too! Just call your Lindberg Field Engineer (he's listed in your classified phone book) or write us direct. Lindberg Engineering Company, 2491 West Hubbard Street, Chicago 12, Illinois.

*Los Angeles plant: 11937 S. Regentview Avenue, Downey, California.  
In Canada: Birleco-Lindberg Ltd., 15 Pelham Ave., Toronto 9, Ont.  
Also, Lindberg plants in Argentina, Australia, England, France,  
Italy, Japan, Spain, Switzerland and West Germany.*

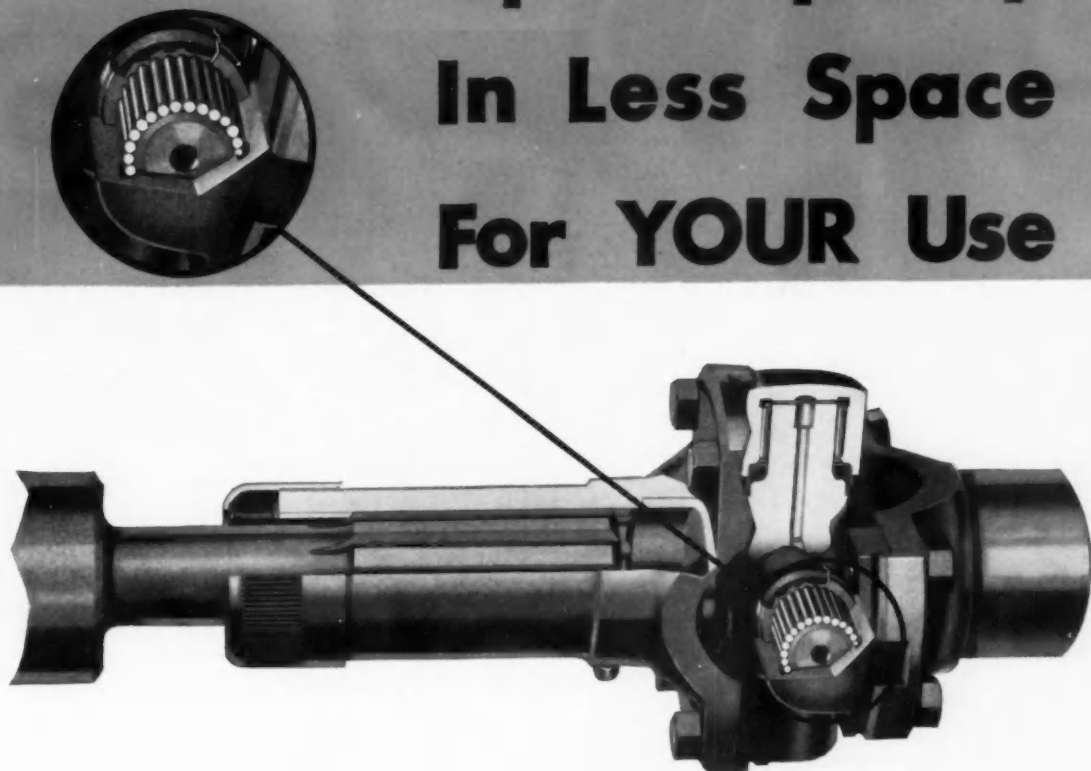
**LINDBERG**  
heat for industry

*Gears being loaded in Lindberg Furnace at Commercial  
Shearing and Stamping Company, Youngstown, Ohio.*





# **MECHANICS** Has Designed More Torque Capacity In Less Space For YOUR Use



Through the design and use of an internal snap ring combined with precision roller bearings, MECHANICS UNIVERSAL JOINT DIVISION can give your product more torque capacity with less weight in less space. To reduce maintenance costs and down-time—to multiply your product's useful life—specify a dependable MECHANICS

Roller Bearing UNIVERSAL JOINT. Let MECHANICS engineers help you build more compact power and reliability into your (200 to 50,000 foot pounds torque capacity) machines. Write today for our NEW FREE CATALOG J-1960 which gives dimensions, capacity tables and complete specifications.

## **MECHANICS UNIVERSAL JOINT DIVISION BORG-WARNER CORPORATION**

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*Roller Bearing Joints For Cars • Trucks • Tractors • Farm Implements •*

*• Road Machinery • Aircraft • Busses and Industrial Equipment •*

MECHANICS

**B-W**

UNIVERSAL JOINT

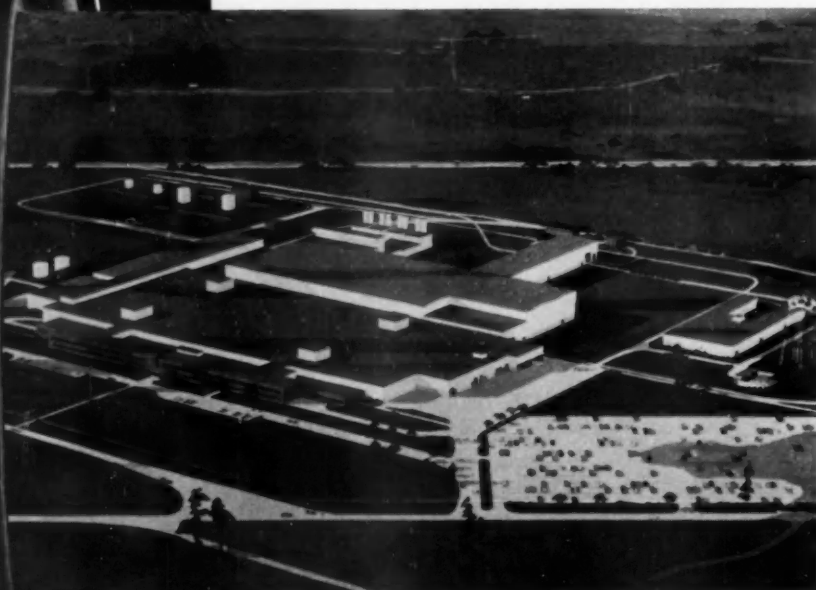
**BORG-WARNER**

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## TO MEET THE CHALLENGE OF THE FUTURE



WORLD'S LARGEST PRODUCER  
OF AUTOMOTIVE  
WHEELS, HUBS AND DRUMS.

# KELSEY-HAYES

AUTOMOTIVE, AVIATION AND AGRICULTURAL PARTS HAND TOOLS FOR INDUSTRY AND HOME

Over one-million square feet of floor space  
(bigger than twenty-three football fields).  
That's the size of Kelsey-Hayes' new corporate  
headquarters and automotive wheel  
manufacturing facilities at Romulus, Michigan.

With centralized control and all facets  
from development through production  
under one roof, the new Kelsey-Hayes  
plant is equipped with the best . . . with  
everything it takes to meet the challenge  
of finest in wheels for the great new cars  
of the future. Kelsey-Hayes Co., Romulus, Mich.



# COMPANY

OPERATIONAL PLANTS: Detroit, Jackson and  
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# Piston Rings... Sealing Rings

WHEN  
RING REQUIREMENTS  
CALL FOR  
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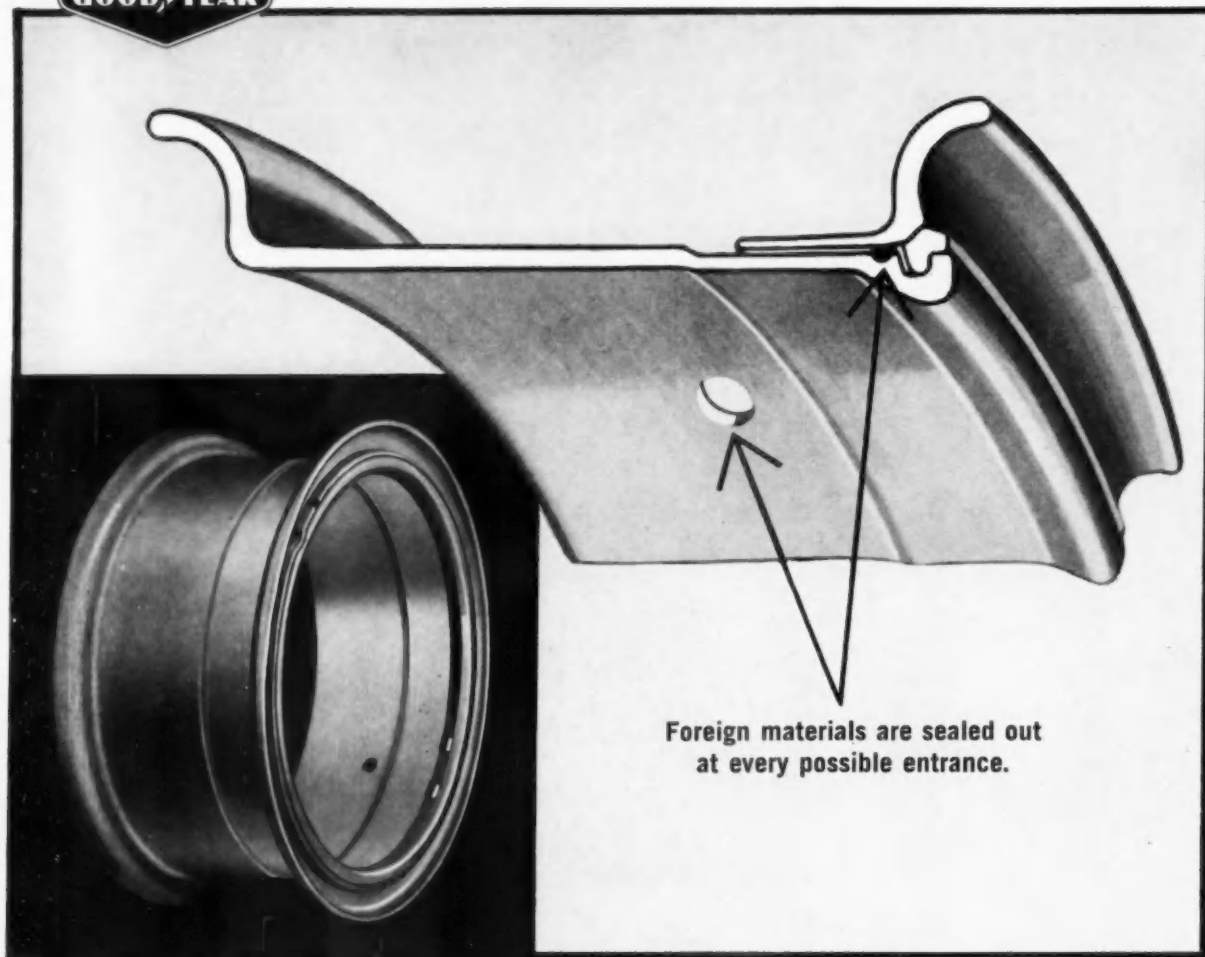
# McQUAY-NORRIS

For more than fifty years McQuay-Norris engineers have worked side by side with original equipment engineers in the design of quality piston rings and sealing rings. With this experience you can be sure that McQuay-Norris can produce rings to your exact specifications, with delivery when and as you need them.



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GOOD YEAR



Foreign materials are sealed out  
at every possible entrance.

## Exclusive Job-Master design stops 99% of rim corrosion and erosion

**JOB-MASTER RIMS KEEP CORROSION AND EROSION TO A MINIMUM** through their exclusive rubber sealing ring and round valve hole. And you get added protection—before and during use—from another exclusive: Baked-on, super-corrosion-resistant Bond-A-Coat finish. Results: Much longer rim life, much longer tire life.

**NOTE THIS TOO:** Only Job-Master offers all these additional features • 3° tapered bead seats for full support of *both* beads—virtual elimination of bead

chafing • Integral flange and bead seat for better balance and alignment • Industry's closest manufacturing tolerances—minimizes lateral and radial runout • Standard 28° bevel for full interchangeability with existing equipment.

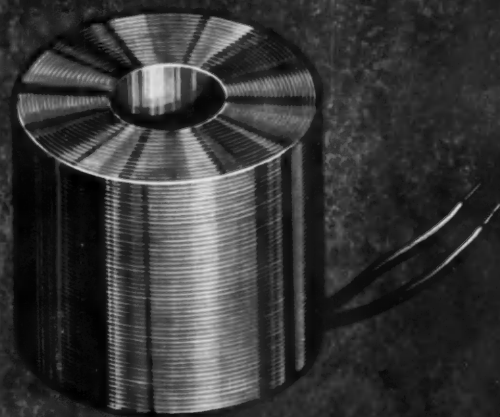
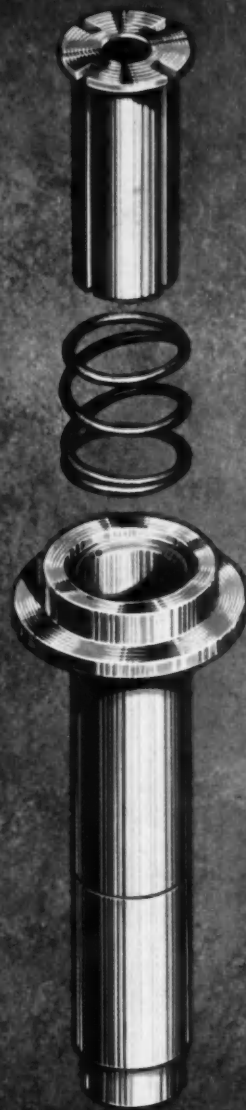
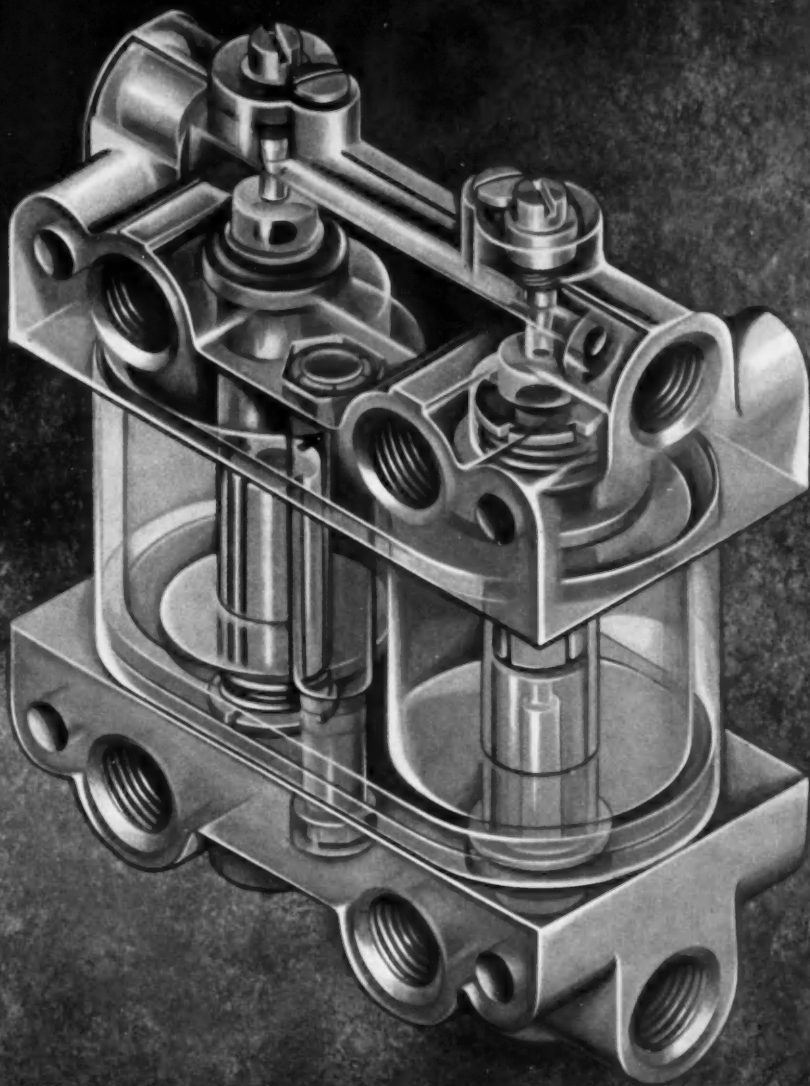
**DON'T DELAY!** Start now to enjoy the benefits of Job-Master—first rim designed to meet the exacting needs of modern tire design. See your Goodyear Rim Sales Engineer or Distributor. Or write: Goodyear, Metal Products Division, Akron 16, Ohio

Lots of good things come from

**GOOD YEAR**



Job-Master—T.M. The Goodyear Tire & Rubber Company, Akron, Ohio



**Compact 4-way**

**SKINNER**

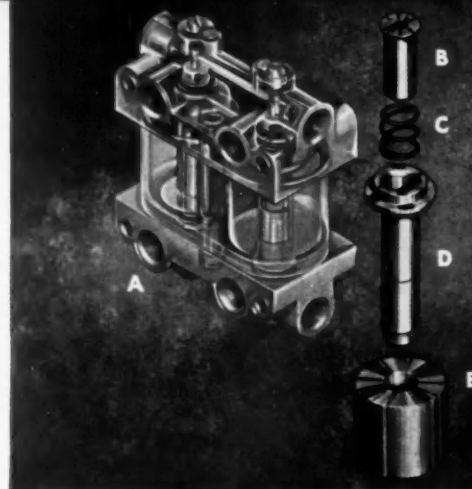
**Solenoid Valves**

**assure precise cylinder control**



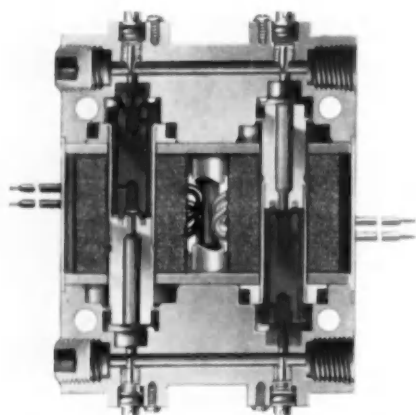
## Here's how accurate, dependable operation is built into SKINNER 4-way solenoid valves

- Precise flow control—by adjustable metering
- Compact, direct acting—two 3-way valves in one housing
- Durable and corrosion resistant—stainless steel internal parts
- Leakproof, bubbletight sealing—soft, synthetic inserts
- Positive operation mounted in any position—spring-loaded plungers
- Underwriters approved—wide selection of coils, voltages and frequencies
- Wired from front or rear—housing easily reversed
- Adaptable to many uses—optional porting arrangements



A. Transparent view of 4-way solenoid valve B. Plunger  
C. Plunger return spring D. Sleeve E. Coil

## SKINNER four-way solenoid valves available in three basic types



The Skinner V9 solenoid valve is two 3-way valves in one compact housing. Both valves may be independently controlled and metered to provide accurate, dependable control of single- or double-acting cylinders, or larger pilot-operated valves.

V9 types are available without adjustable flow and with metering at both exhaust ports, both inlet ports or full metering of all ports.

• • •

For complete information, contact a Skinner Distributor listed in the Yellow Pages or write us at the address below.

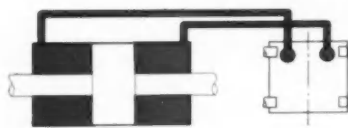
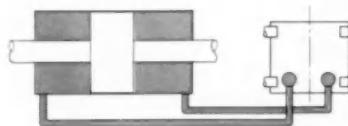
### V9 SERIES SPECIFICATIONS

Media—air, hydraulic oils, inert gases  
Orifice Diameter— $\frac{3}{64}$ ",  $\frac{1}{16}$ ",  $\frac{7}{32}$ ",  $\frac{1}{8}$ "  
Pipe Size— $\frac{1}{4}$ " NPTF  
Maximum Operating Pressure Differential—0 to 150 PSI  
(up to 225 PSI also available)  
Temperature Range—minus 40°F. to plus 180°F.  
Cv Factor— $\frac{3}{64}$ " .052,  $\frac{1}{16}$ " .095,  $\frac{7}{32}$ " .156,  $\frac{1}{8}$ " .214  
Mounting— $\frac{1}{4}$ " through-bolt holes.

**Normally closed—normally closed V933 valves with a neutral position.** Generally applied on double-acting cylinders where the piston is in a neutral position without pressure when both coils are de-energized. This permits manual shifting of the piston without operating the valve.

**Normally open—normally open V955 valves with a neutral position.** Generally applied on double-acting cylinders where both sides of the piston are to be open to pressure when both coils are de-energized. Under certain conditions, the first operating stroke of double-acting cylinders will be smoother with this valve in use.

**Normally closed—normally open V935 valves with no neutral position.** Generally applied on double-acting cylinders where the piston is to be in retracted or extended position with pressure when both coils are de-energized. Wiring is simple—both coils are operated simultaneously and can be controlled by one single-pole, single-throw switch.



When you specify solenoid valves, specify Skinner. Skinner solenoid valves are distributed nationally.



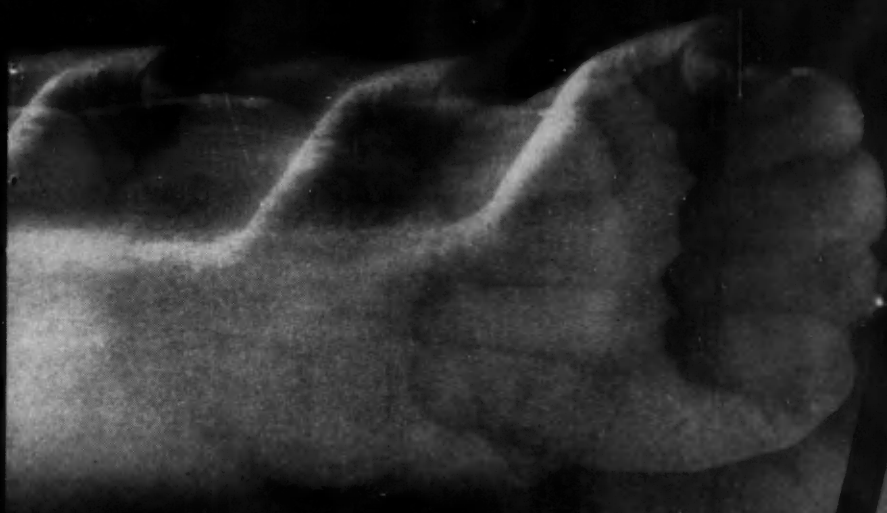
THE CREST OF QUALITY

# SKINNER ELECTRIC VALVES

SKINNER ELECTRIC VALVE DIVISION  
SKINNER PRECISION INDUSTRIES, INC. • NEW BRITAIN, CONNECTICUT, U.S.A.

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# HIT IT HARD!

Take a Ledloy® steel—Inland's famous family of free machining steels—and give it all you've got! Go on—double and triple your normal speeds. Up to 325 sfm is common with Ledloy and believe us, far greater speeds are perfectly possible—up to 450 sfm with high speed tools—600 sfm with carbide tooling. ■ Step up the feed, too. Drill at 40 inches per minute at 750 rpm if you have the equipment for it. Matter of fact, you can't tell how much faster—better—you can do with a Ledloy steel 'til you've pushed

it to the limit. ■ One thing to remember—you won't get these amazing results with just any leaded steel. To get the most out of your equipment, use Inland Ledloy—the original leaded steel. ■ That's right—Inland made leaded steels long before anyone else—has been developing the unique properties of Ledloy steels for more than 20 years—can recommend exactly the right type for your shop and your product. So use Ledloy steels—hit them with all you have...

## LEDLOY® STEELS CAN TAKE IT!

*the world's most machinable steels* **INLAND STEEL COMPANY**

30 West Monroe Street • Chicago 3, Illinois





## NYLON PRESSURE TUBING

for Hydraulic-  
Pneumatic  
Service



On one design after another,  
Garlock Nylon Pressure Tubing  
proves superior to other materials.

One specific instance concerned a hydraulically-controlled wheel dresser. The hose lines draped over the multiple-head grinders and fouled the controls. This not only impeded operation, but looked bad from an appearance standpoint. Nylon Pressure Tubing was applied. As a result, tubing cost was reduced by 70%, and installation time was cut to a minimum. Because of the self-supporting feature of the tubing, "draping" of the line was eliminated; this made operation safer, improved overall design of the wheel dresser.

**In cost, too,** Garlock Nylon Pressure Tubing has the advantage. Seamless copper and extruded aluminum is approximately four times as much, while welded and seamless stainless steel costs 29 to 37 times more, respectively. Also, the cost of couplings and installation labor should be considered—Nylon Pressure Tubing needs no intermediate couplings or fittings . . . is simple to install. You save on first cost, fittings, and labor.

**An outstanding design material.** Garlock Nylon Pressure Tubing is unaffected by oils, alkalies, hydraulic fluids and solvents that corrode metals . . . resists vibrational fatigue, abrasion, impact . . . withstands temperatures from -60°F to +300°F . . . available in 1000 and 2500 p.s.i. burst ratings, conforming to J.I.C. specifications. Diameters from 1/8" O.D. to largest size commercially made.

**For more data,** call your representative at the nearest of the 26 Garlock sales offices and warehouses throughout the U.S. and Canada. Or, write for Catalog AD-177. Garlock Inc., Palmyra, N.Y.

**Canadian Div.:** Garlock of Canada Ltd.

**Plastics Div.:** United States Gasket Company

**Order from the Garlock 2,000 . . .** two thousand different styles of Packings, Gaskets, Seals, Molded and Extruded Rubber, Plastic Products.

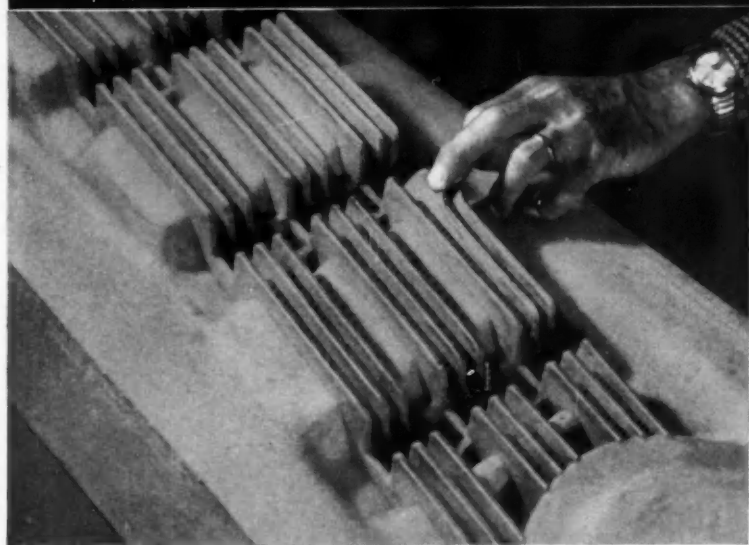
Garlock Nylon Pressure Tubing can be twisted, flexed, bent . . . ideal for hydraulic-pneumatic systems, pressure lubrication lines, oil and fuel lines, vacuum connections.

# GARLOCK

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Circle 120 on Inquiry Card for more data

# Perfect Prototypes...Fast!



## Silastic RTV puts designs into 3-D easily, quickly, economically

Turning intricate designs into prototypes and finished parts is greatly speeded and simplified with Silastic® RTV, the versatile fluid silicone rubber that vulcanizes at room temperature. Prototypes made with this new engineering "tool" are exact reproductions of the original patterns.

### How it's done.

Here's how one automotive parts supplier uses Silastic RTV in producing small quantities of experimental grilles. The first step, illustrated at top, is a precise wooden pattern of the design. Next, plaster is poured over this pattern to form the first mold. Then, Silastic RTV takes over. This fluid rubber flows easily into the plaster mold, conforming to the finest

detail, then cures at room temperature to form a firm-but-flexible *exact* duplicate of the original wood pattern.

Now, a second plaster mold is made from the silicone rubber duplicate. Alloys are poured into this plaster mold to form finished metallic prototype parts.

Why bother with Silastic RTV and the extra step? Several good reasons. First, Silastic RTV releases the plaster mold quickly, smoothly — something that's difficult with wood originals. Second, by "standing-in" for the original wood pattern, Silastic RTV protects that costly pattern from harm. Another important benefit is durability. The silicone rubber duplicate can be used over and over again!

Silastic RTV resists temperatures up to 500 F, enabling you to make prototypes directly from the RTV mold with plastics. Examples: trim parts, instrument panels and many other parts important to overall design and beauty.

Every day more and more engineers turn to Silastic RTV for help in cutting costs, in reducing time requirements, in pretesting of new designs. How can this versatile material best serve you? Investigate today.

For detailed information on Silastic RTV, contact the Dow Corning office nearest you, or write Dept. 0917A



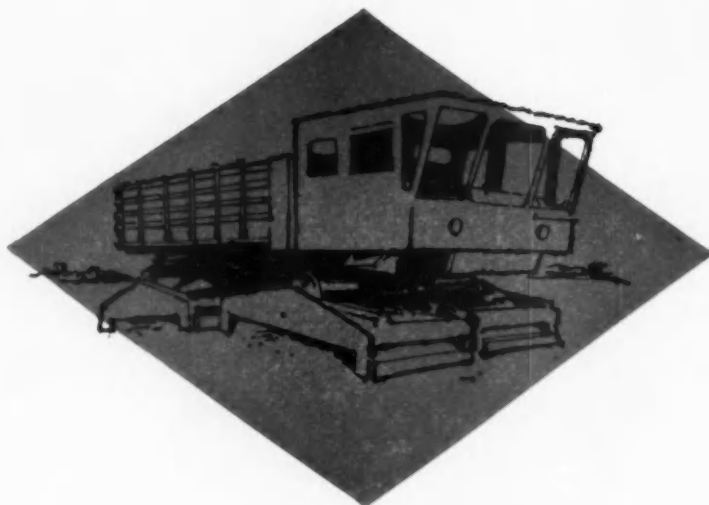
**Dow Corning CORPORATION**  
MIDLAND, MICHIGAN

ATLANTA BOSTON CHICAGO CLEVELAND DALLAS LOS ANGELES NEW YORK WASHINGTON, D. C.

# TOUSEY S|Q DURACOTE

... for the manufacturer who stores finished equipment in an open area for an indefinite period before selling.

**1.** Tousey Duracote eliminates costly retreating, even after several months of open air storage.



**2.** Tousey S/Q Duracote has greater film flexibility retention. (Tests show up to 100% increased retention over many first line quality finishes.)

**3.** Tousey S/Q Duracote can be duplicated in both color and method of application to your present finish.

For a new dimension in performance try Tousey S/Q Duracote on your products.

A request written on your stationery will bring complete information about this remarkable new finish.

## TOUSEY VARNISH COMPANY

Chicago Division:  
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Quad-Cities Division:  
2500 8th Avenue, East Moline, Illinois







## SHOULD A MATERIAL BE LIGHT OR RIGHT?

The properties of cast iron make it practically ideal for a great many automotive parts. Why "practically" ideal? Because the industry has heard a lot of promotion and commotion about just one thing lately—and that's *weight*. But the importance of saving weight is relative; the ability to do the job comes first. Otherwise cars, and coins, could be made of wood or feathers or cork.

For example, why take a part made of a hard, dense material like cast iron—with its high tensile strength and ability to stand up to extremes of heat, vibration and friction without getting tired—and substitute another, more expensive material (with fewer of these characteristics) *simply because it is not as heavy*? Replacing the right

material with a lighter one could affect production costs so that the 100 pounds not in the car would be the most expensive pounds of all!

Since car owners today are demanding *more* dependability and manufacturers have *lengthened* warranty periods, is this the time to trade long life for high-priced lightness?

Many automotive engineers and designers, along with their colleagues in the iron foundry industry, believe that this is the time to use materials with the natural characteristics best suited to the job, and make *them* as light as possible through design and engineering. Together, they have already developed iron castings that reduce vehicle weight—economically.

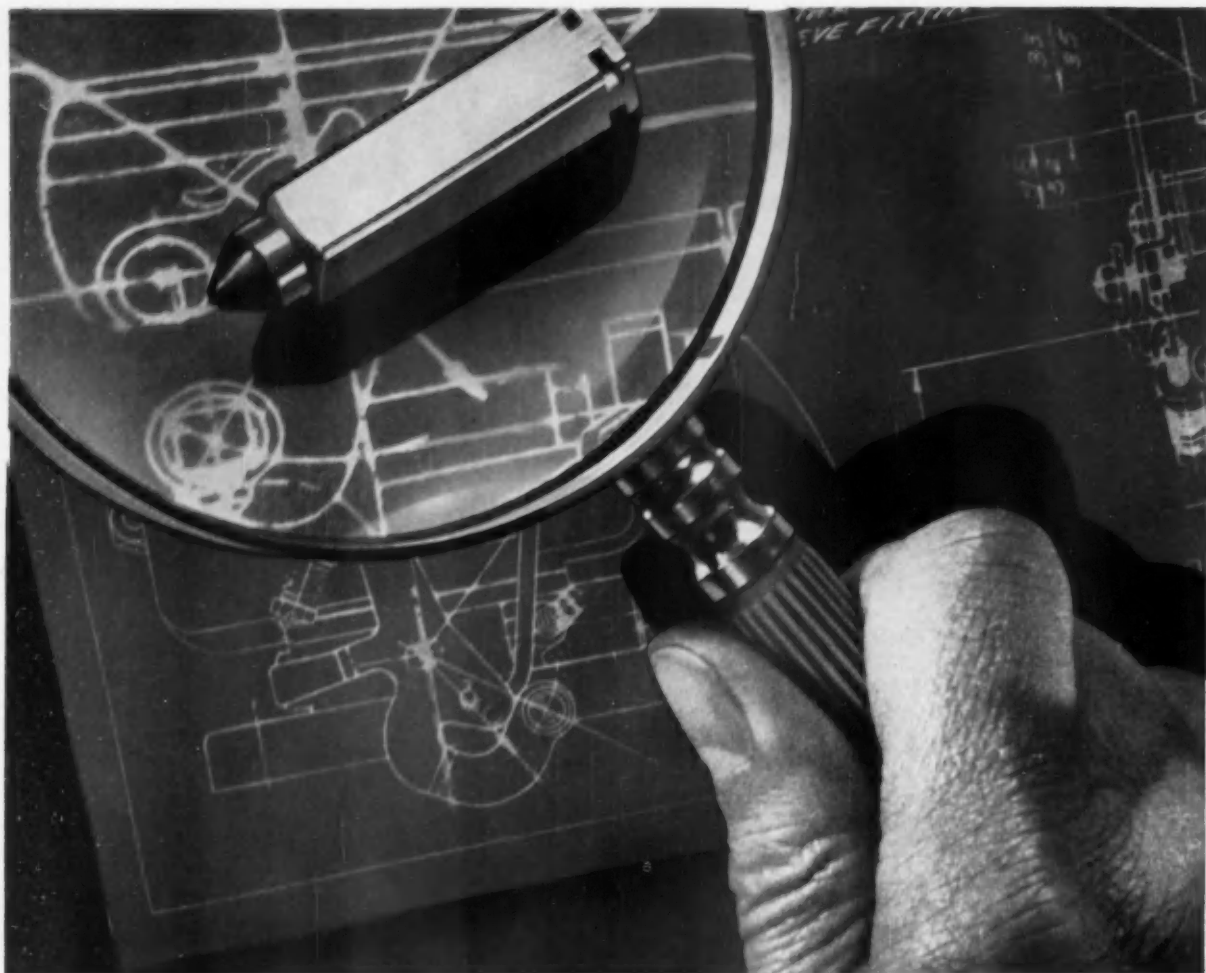


### THE HANNA FURNACE CORPORATION

Suppliers of quality pig iron to the American foundry industry  
Boston • Buffalo • Chicago • Detroit • New York • Philadelphia

Hanna Furnace is a division of

### NATIONAL STEEL CORPORATION



## Meet the Holley needle that has proved its point!

In over 55 years, Holley engineers have tackled—and solved—many tough carburetion problems. One of the most frustrating has been carburetor flooding, caused by dirt particles found in the fuel supply which prevented steel or rubber-tipped needle valves from seating properly.

Holley engineers found the answer in a fuel inlet needle valve tipped with Viton\*, a tough DuPont material with resilient properties that let the needle valve seat perfectly. More than two years of exhaustive testing have proved that the Viton Needle assures thousands of miles of trouble-free driving.

The Viton Needle is one more addition to a long list of design and development contributions which Holley has made to improve carburetion and ignition equipment for better car and truck performance.



Holley Carburetors and Ignition Equipment maintain the Holley reputation for precision, quality and dependable performance.

**HOLLEY**  
*Carburetor Co.*

RESEARCHERS AND DEVELOPERS  
IN THREE OF AMERICA'S  
MOST IMPORTANT INDUSTRIES

I-35

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**AUTOMOTIVE DIVISION • AIRCRAFT DIVISION • ELECTRO-MECHANICAL DIVISION**

# THE PROPER USE OF SPECIFICATIONS

Specification testing is useful as a method of quality control. But specifications alone do not form a sound basis for gasket selection or predicting gasket performance, since performance is determined by the interaction of many factors.

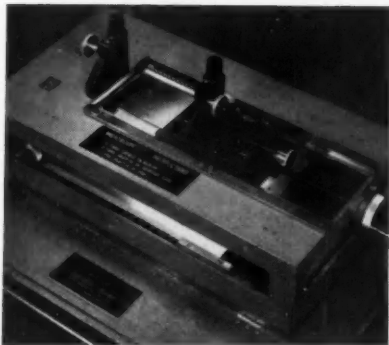
EDISON POWERS

Armstrong Research and Development Center

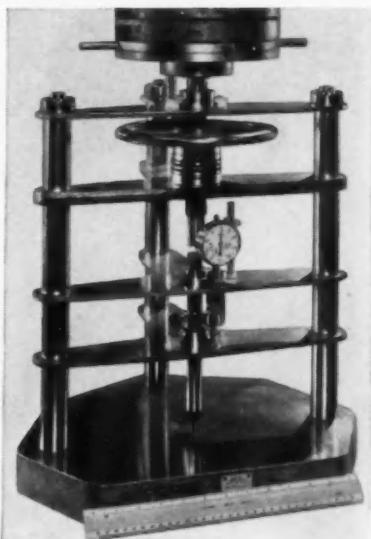
A resilient gasket material that meets all pertinent government and industry specifications may still fail to provide a satisfactory seal in actual service. At the same time, a material that falls short of one particular specification may well be the most suitable for a certain application.

The reason for this is that gasket performance is determined by many factors—such as flange pressure, contained fluid, qualities of the material—in infinite combinations. It is impossible to set up tests which will take all the combinations of these factors into consideration.

As a result, specifications frequently do not give a realistic idea of the gasket's performance. For instance, many gasket specifications have rigid tensile strength requirements. Tensile strength is easily measured. Yet it usually has little bearing on the sealing ability of a material. For all practical purposes a gasket needs only sufficient tensile strength to hold its shape until it goes to work in the flange.



This Armstrong-developed instrument—called a dilatometer—is used to study dimensional changes in gasket materials caused by different conditions of temperature and humidity. It can detect variations as small as half a mil in a 12" sheet.



This device is used by many laboratories to help standardize gasket testing. Developed by Armstrong and recognized by the National Bureau of Standards, it is used to measure indentation and recovery characteristics of resilient gasketing materials.

Tests for resistance to liquids are also unrealistic where uncompressed strips of gasket materials are completely immersed in various fluids. Test results may show intolerable changes in such factors as volume, compressibility, recovery, and elongation. In practice, however, only the edge of the gasket is exposed, and the effect of the fluid may be negligible.

Other tests—ream weight and bursting strength, for example—have been taken from the paper industry. Again they are of little help to gasket users in selecting materials.

Compounding the difficulties of selection by specification is the lack of standardization in test procedures and instruments. In the matter of compressibility alone, there are the variables of sample size and type of pressure foot, and the method and speed of load application.

Another difficulty with the practice of buying gaskets by specification is the fact that it may delay the discovery and use of new materials that will do the job better. Unless specifications are frequently reviewed, they are likely to be outdated.

Gasketing efficiency can be improved by asking the question, "Will it do the job better?", when you select a material rather than, "Does it meet our specifications?" Once you have selected the proper material, you can establish new specifications and then put specification testing to its proper use—as a means of quality control to make sure that each succeeding shipment of gasket material has the same physical and chemical characteristics.

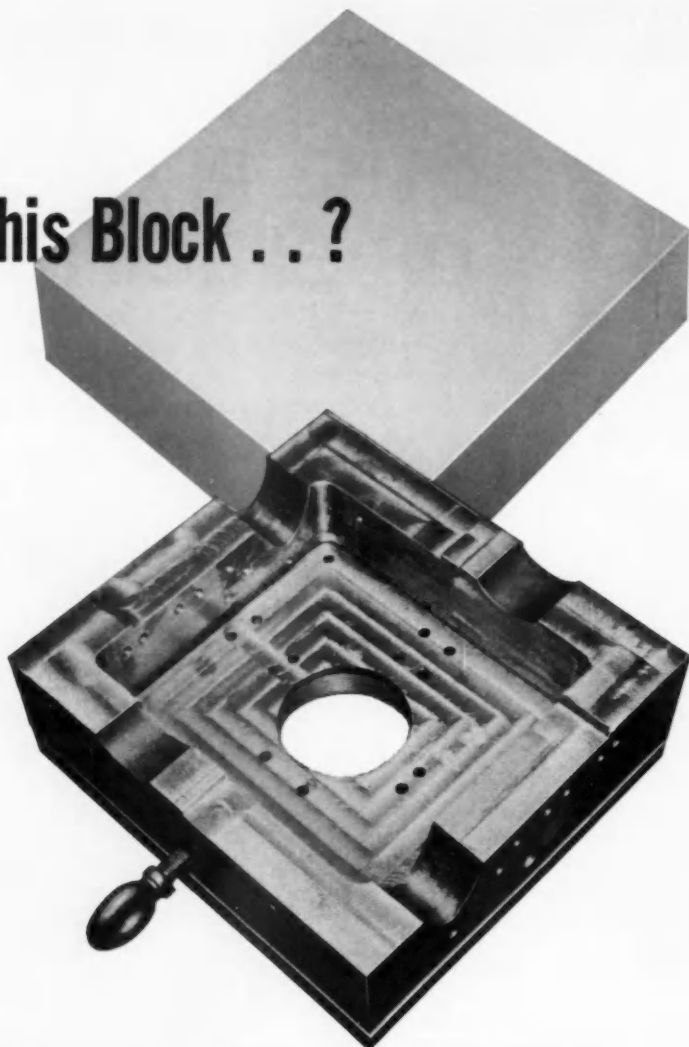
The Armstrong Gasket Design Manual offers a wealth of research material on gasket design and selection. If you would like help in selecting a gasket material or establishing new specifications or a copy of the manual, write Armstrong Cork Company, Industrial Division, 7105 Imperial Avenue, Lancaster, Pennsylvania.



## Armstrong GASKET MATERIALS

# Why start with this Block . . ?

When you can  
use A-L  
cast-to-shape  
tool steel



## and save \$1,250 on the finished job!

Here's how a manufacturer of automobile horns saves \$1,250 on this die retainer or holding block by specifying an Allegheny Ludlum Cast-to-Shape tool steel, prehardened to specifications

The block contains 1250 pounds of expensive alloy steel. Also 150 hours of machining time at a cost of \$1,000 are needed to fabricate it into a die retainer.

The Cast-To-Shape tool steel weighs only 650 pounds—a \$250 savings in metal that would have ended up on the floor as chips. With only 1/4" to 3/8" of surplus stock on its surface, Cast-To-Shape tool steel requires one roughing and one finishing operation to complete the job.

The estimated total savings by using Allegheny Ludlum Cast-To-Shape tooling, including the extra for pattern cost, amounts to \$1,250.

Allegheny Ludlum Cast-To-Shape tool steel castings are available in a full range of grades. There's one to fit your needs. Write for booklet FC-4. It's free.

The new edition contains 28-pages of technical discussion on A-L's Forging and Casting Division with applications, pattern information, design tips, analyses and heat treating instructions.

The booklet also covers details of the *flat forgings* of tool, SAE and stainless steels available from the Forging and Casting Division plus information on cost-cutting *Composite Dies*.

To find out how you can cut costs on complex tools, using F & C products, call your nearest A-L Tool Steel representative or write *Allegheny Ludlum Steel Corporation, Forging & Casting Division, Ferndale, Detroit 20, Mich. Address Dept. AI-5.*



**ALLEGHENY LUDLUM**  
FORGING AND CASTING DIVISION

3097



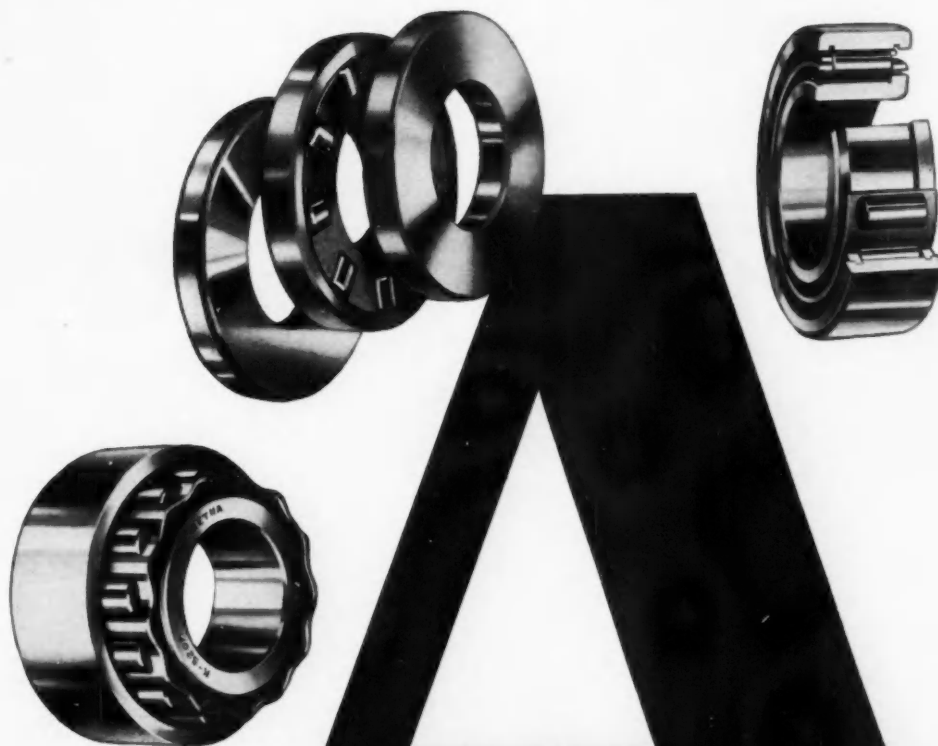
**THERE'S MUSCLE IN AETNA ROLLER BEARINGS** Aetna roller bearings offer an increased load capacity of more than 25%\* over conventional roller bearings. This extra muscle is created by Aetna's exclusive True Crowned roller design. In this design, ordinary high stress points are eliminated, and the load is distributed across the full length of the roller for greater efficiency. True Crowning is an example of our advanced technology, which consistently provides you with more dependable bearing performance. Aetna roller bearings are available in a wide range of self-contained, pure radial, standard designs, and in many specials of both pure radial and pure thrust design. For details call your Aetna representative listed in your classified directory, or write for General Catalog and Engineering Manual.

\*Determined by AFBMA formula

**AETNA BALL AND ROLLER BEARING COMPANY**  
DIVISION OF PARKERSBURG-AETNA CORPORATION

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ANTI-FRICTION SUPPLIERS TO LEADING ORIGINAL EQUIPMENT MANUFACTURERS SINCE 1916



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ROLLER  
BEARINGS

# *Custom Quality* **OHIO A COLD DRAWN**

*features improved physicals,  
closer tolerances, better finish*



Arrows indicate approximate center of weld line. After normalizing, cold drawing and annealing, the weld area cannot be detected even when the polished and acid-etched surface is magnified 100 diameters. This perfect microstructure makes Ohio Drawn-Welded, in every sense, weldless — an ideal tubing for critical mechanical and pressure applications. In addition to cold drawing, a severe test in itself, non-destructive tests such as air, water, magnetic and eddy current, insure 100% acceptability.

# WELDED STEEL TUBING

## Now Available in Larger Sizes... Heavier Wall Thicknesses

### **NEWS ITEM:**

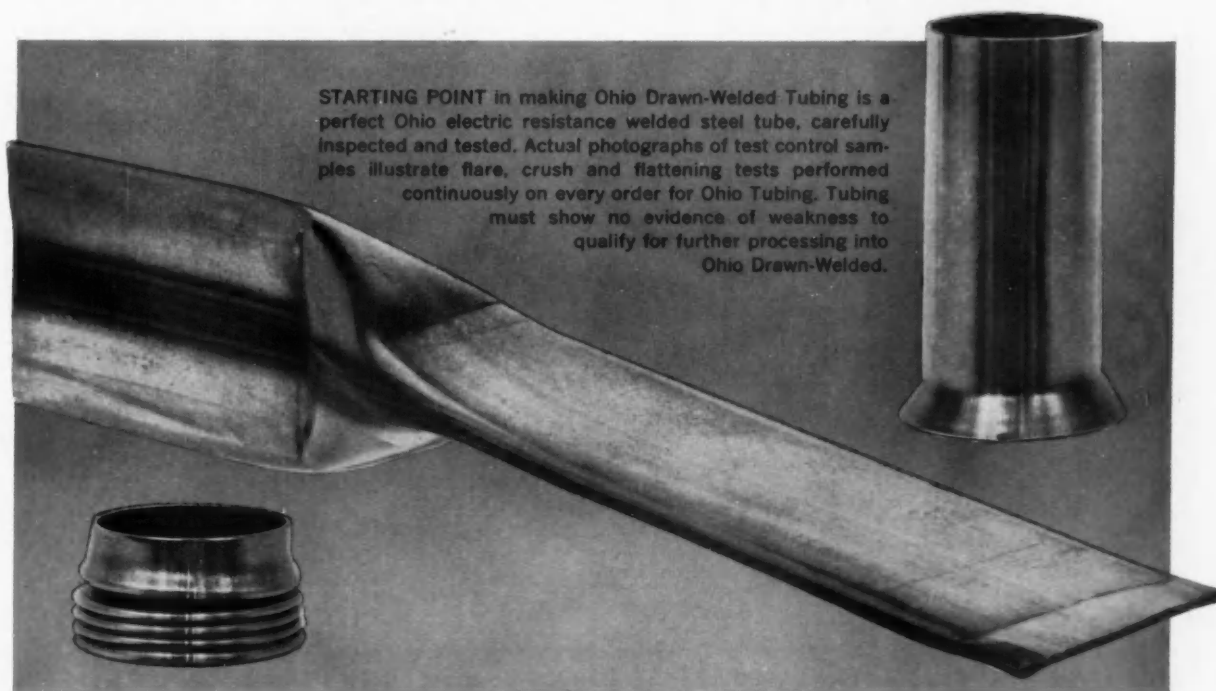
Ohio Seamless is now cold drawing quality electric resistance welded steel tubing up to 7¼ inches with wall thicknesses to .344. Ohio Custom Made Drawn-Welded Tubing is here now — in greater range of sizes, wall thicknesses, finishes than ever before.

### **TECHNICAL ITEM:**

Controlled normalizing assures desired microstructure... Precision cold drawing imparts special physical properties, assures uniform wall thickness, delivers closer dimensional tolerances and superior surface finish.

### **ACTION ITEM:**

This all adds up to a new major-source capability that can help you design with new freedom, manufacture at lower costs. Mark your orders: Ohio Custom Made Tubing. Either welded or seamless, it's your best buy whenever tubing is the best shape.



STARTING POINT in making Ohio Drawn-Welded Tubing is a perfect Ohio electric resistance welded steel tube, carefully inspected and tested. Actual photographs of test control samples illustrate flare, crush and flattening tests performed continuously on every order for Ohio Tubing. Tubing must show no evidence of weakness to qualify for further processing into Ohio Drawn-Welded.



## **OHIO SEAMLESS TUBE**

*Division of Copperweld Steel Company • SHELBY, OHIO*

*Seamless and Electric Resistance Welded Steel Tubing • Fabricating and Forging*

*Representatives in principal cities. Check leading directories:*

**THOMAS', MacRAE'S, CONOVER-MAST, SWEET'S, FRASER'S.**



Ross model S10 steering... 8:12:8 variable ratio, 2.1 turns lock to lock, aluminum components.

## I have Ross variable-ratio steering, too!

● Riding mowers and golf carts . . . passenger cars, trucks, buses . . . tractors and combines . . . cranes, graders, sweepers, earthmovers—*all* depend on Ross steering, manual or power, constant or variable ratio.

Ross invites *your* steering inquiry.

**Ross**

# STEERING

**ROSS GEAR & TOOL COMPANY, INC.**

Ross Division, Lafayette, Indiana • Gemmer Division, Detroit, Michigan





small in size...

**BIG** in dependability...



Take this arm rest screw, for instance. Only three inches long, yet it is correct in materials and specifications to do the most dependable job. The same applies to National Lock connecting rod bolts, engine head bolts, bumper and wheel bolts, hood latches, catches, plastic connectors, distributor caps and hardware of all kinds. National Lock's design-engineering ability and plant capacity make it a leading supplier of quality hardware, fasteners and plastic components to over 40 different O.E.M. markets. And this means experience at every step of engineering and production . . . diversified experience resulting in lower product costs, better product features and finer product quality. Write us on how we can answer your requirements . . . large or small.

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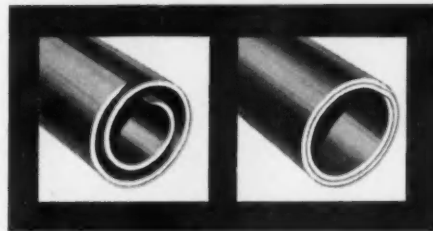
Bundy can mass-fabricate practically anything



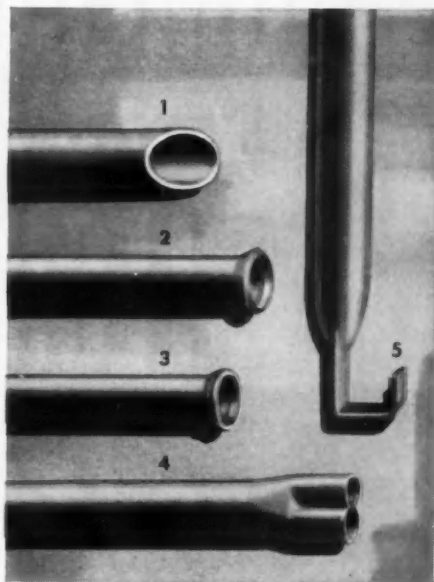
And this mass-fabrication experience can help you. Whatever kind of small-diameter steel tubing you are now using—or plan to use—Bundy can probably make it better . . . in quantities of thousands or millions. How? By making your part from Bundyweld®, the steel tubing that's rated tops in safety in the automotive industry. Bundyweld tubing meets ASTM-254; Govt. Spec. MIL-T-3520, Type III. And by applying years of problem-solving experience to your tubing problem, Bundy engineers can often find short cuts that shave costs in mass-fabrication. Let Bundy experience help you. Write: Bundy Tubing Company, Detroit 14, Michigan.

**BUNDY TUBING COMPANY • DETROIT 14, MICH. • WINCHESTER, KY. • HOMETOWN, PA.**

World's largest producer of small-diameter tubing. Affiliated plants in Australia, Brazil, England, France, Germany, Italy, Japan.



Bundyweld, double-walled from a single copper-plated steel strip, is metallurgically bonded through 360° of wall contact. It is lightweight and easily fabricated . . . has remarkably high bursting and fatigue strengths. Sizes available up to 5/8" O. D.



Bundy can mass-fabricate small-diameter steel tubing to solve a wide variety of design problems. The Bundyweld steel tubing shown above is: (1) sheared, (2) flared, (3) double-upset, (4) bifurcated, and (5) closed with flattened end.

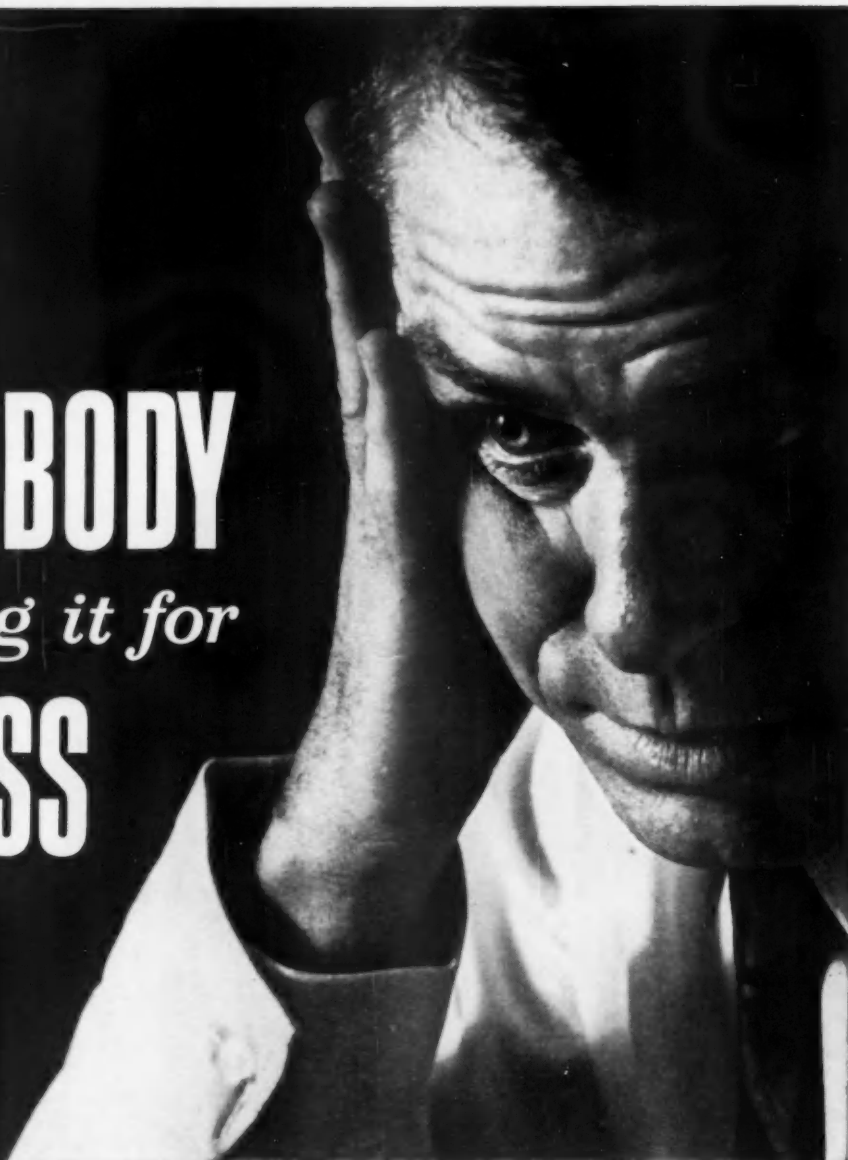
## **BUNDYWELD® TUBING**

Circle 131 on Inquiry Card for more data

# SOMEBODY

*is doing it for*

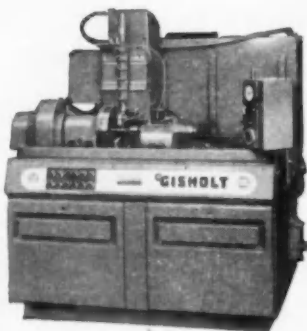
# LESS



## MASTERLINE® 51B SUPERFINISHER

New—for parts not requiring traverse. Longitudinally adjustable platen supports reciprocating unit holding one or two quills. Add a second platen and you can handle up to four diameters at once—automatically.

Model 52A, which is similar, offers longitudinal stone traverse. Call your Gisholt Representative or write for Catalog 1159-C.



Are you giving your competitors a price edge by not using Superfinishing?

This modern process enables you to control surface finish from 1 micro-inch RMS to 80—piece after piece—*automatically*. Whether you Superfinish® after grinding or direct from turned surfaces, you will improve quality, metallurgy and geometry. And in either case you save time and money.

Whether you finish cylindrical, tapered, flat or spherical surfaces, Superfinish enables you to do a better job at less cost.



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MACHINE COMPANY

Madison 10, Wisconsin, U.S.A.

Turret Lathes • Automatic Lathes • Balancers • Superfinishers • Threading Lathes • Factory-Rebuilt Machines with New-Machine Guarantee



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Circle 133 on Inquiry Card for more data

Circle 134 on Inquiry Card for more data →



# Much of the beauty of Chrysler cars

*The proper foundation of a Chrysler-style paint job shows itself in this gleaming Plymouth "body-in-white"—steel with the surface finish a truly fine car must have.*

Body parts for Chrysler cars emerge from a complex of huge presses and coils and sheets of flat rolled steel. Floor pans are formed, to be welded further on into single unitized assemblies of 50 major parts by fully-automated resistance welders. Doors are stamped with great precision, and 100 ton presses squeeze out car roofs, without a break or blemish.

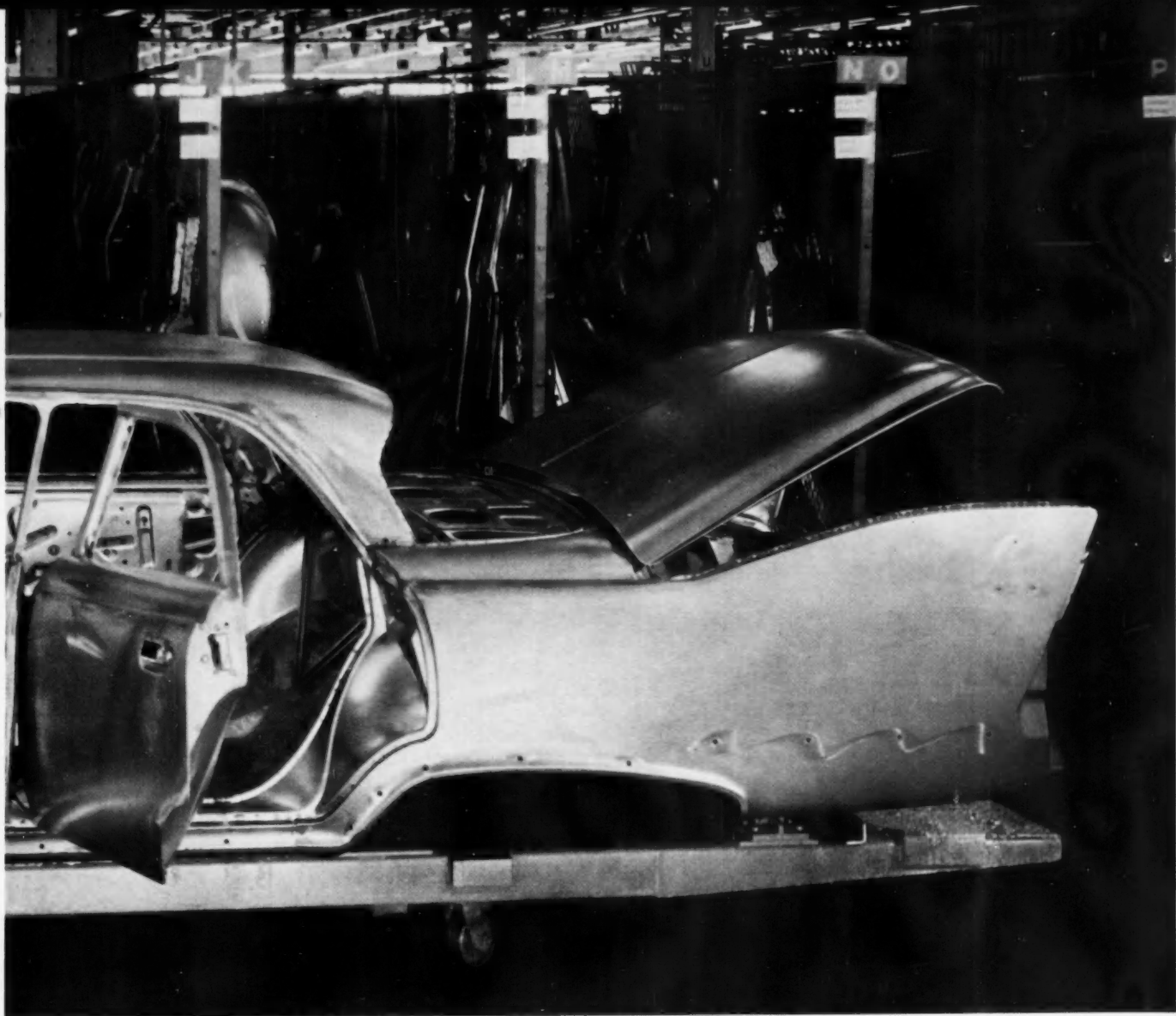
This is Chrysler Corporation's Ohio Stamping Plant, giant of the auto industry, where 28 major stamping lines eat 2000 tons of steel a day and produce 600 different body parts. Steel is the basic raw material of this amazing plant—and the men who buy and use it know exactly what they need. As a regular supplier, J&L matches their needs *consistently*.



**Jones & Laughlin Steel Corporation**

3 GATEWAY CENTER, PITTSBURGH 30, PA.





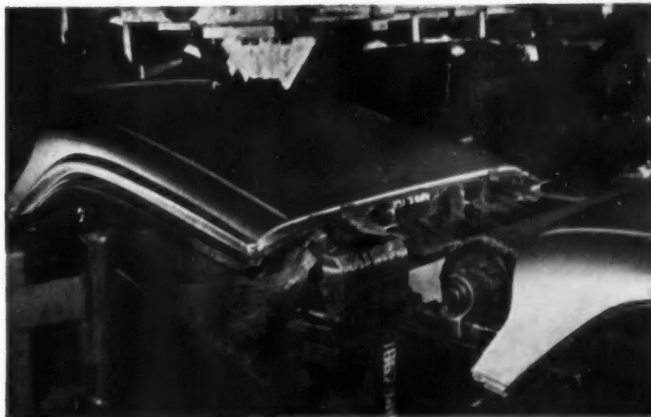
Feast your eyes on over 1000 lbs. of unadorned steel! Notice how the steel itself contributes to the elegance and grace of Chrysler styling—how, even in this raw metal stage, the "body-in-white" has a lustrous finish of real beauty.

## comes from the steel itself

Each die-forming situation is individual and demands a specific set of metallurgical properties from the steel. In many cases, the factor of extreme importance is surface finish of the steel. Other times, drawing quality is paramount. And often, *combinations* of these and other qualities are needed, balanced one against the other with metallurgical precision.

The Ohio Stamping Plant may be big. But it is a tight operation—efficient, competitive, economical, with full control of quality at all times to insure the beauty and soundness of Chrysler bodies. That J&L steel is bought regularly, and used at one time or another in all the major parts produced by the Ohio Stamping Plant, speaks well indeed for J&L quality.

◀ This Steelmark identifies products made of steel. Look for it when you buy.



This is the roof line—at full rate of production. J&L is one of only three suppliers who can provide the 80-inch, 0.038-gage coils Chrysler needs here. Breaks and strain lines cannot be tolerated on roofs, so drawing quality is vital—as is surface finish, for reasons of appearance.

# **BULLARD REVERSES THE PRICE TREND**

with the ***NEW*** Lower Priced ...  
**MULT-AU-MATIC,**

with these features:

## **Type "M"**

- NEW** Simplified Control
- NEW** Angular Carrier Chip Guards
- NEW** Larger Chip Capacity
- NEW** Index Registry
- NEW** American Standard Spindle Nose
- NEW** Double Coolant Seal on Spindles
- NEW** Design Heavy Duty Clutch and Brake — No Adjustment
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- NEW** Lubrication Filter System
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All Bearings and Gears  
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Easy to Service and Maintain

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Uses American Standard Chucks

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Call your nearest Bullard  
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Bridgeport 9, Connecticut





# NEWS

Vol. 124, No. 10

May 15, 1961

## Mercury Space Shot Aided by Chrysler

By James Dunne, Detroit Regional Editor,  
and C. B. Campbell, News Editor

Automobile industry engineering and know-how played a major role in placing the first U. S. astronaut into sub-orbital flight from Cape Canaveral, Fla.

The giant Redstone booster used for the successful launching was produced by Chrysler Corp. in its Michigan Ordnance Missile Plant near Detroit.

Chrysler engineers designed and built the modifications of the tactical Redstone missile for NASA's Project Mercury. Six of these special boosters were delivered by Chrysler.

### Safety Margins Added

Substantial safety margins were added to proven research and production techniques to assure achievement of the Project Mercury test requirements.

In many instances, safety margins were extended 150 per cent beyond normal Redstone tactical test requirements.

Elaborate new test structures

were specially built for each unit of the booster in order to reproduce conditions encountered in actual flight. The propellant tank structure, for example, was exposed to loads which reached nearly twice

### HYDROSKIMMERS

Shown on the front cover is an artist's conception of a hydroskimmer craft. It is supported by a cushion of high volume, low pressure air. Propulsion may be provided by conventional water propellers, water jets, air jets or air propellers. The theory behind the hydro-skimmers is essentially the ground effect principle of GEM vehicles.

The first hydroskimmer to be built by the Navy will use gas turbines as prime movers. Although the 600 hp engines are not tied to any particular hydroskimmer program requirements for high performance, light weight power plants in the 500-600 hp range are expected.

the expected Mercury load requirements.

Chrysler established and implemented special control procedures to assure that all of the booster vehicles used in the series would be built to the highest possible quality standards.

### Tolerances Reduced

All quality control procedures in effect at the plant were reviewed and upgraded wherever necessary. In many cases, tolerances already extremely close, were further reduced to meet safety margin specifications.

In addition, a specially selected team of engineers was assigned the task of specifically checking each element of the Redstone boosters scheduled for the Project Mercury program.

Chrysler's record in the missile field has been highly impressive. Dept. of Defense announcements show 51 successes in 56 attempts for missiles built by Chrysler.

### British Output Rises

British auto production in March rose to 93,783 cars against 60,425 in February but was still well below the 160,000 units of March, 1960.

March exports dropped to 25,359, or 760 less than in February.

## Rosy Future Seen

Speaking at a combined meeting of the American Zinc Institute and the Lead Industries Association in Chicago, E. C. Quinn, vice president of the Chrysler Corp., painted a rosy future for the automobile industry.

He pointed out that automobiles are multiplying at a faster rate than the population and said this trend will have a big effect on the future of the Nation's car makers and related industries.

Mr. Quinn stressed the phenomenal growth in per capita car ownership since 1920. In that year there was one car for every 13 persons. Now, there is one for every three.

### Trend to Continue

This trend will continue, he said, because of the coming expansion of the 15-to-24 year age group and the continued growth of multiple car families.

In 1954, there were four million multiple car families and last year there were seven million, an increase of 68 per cent, or about 11 per cent a year.

In 1966 and thereafter, Mr. Quinn declared, the average car year should produce close to seven million new car sales. An eight million year by 1970 is a definite possibility, he said.

### Expects 17 Pct. Rise

On the basis of a six million year, the automobile industry consumes 177,000 tons of zinc die castings annually, he pointed out. In 1965, he added, this figure could rise to 207,000 tons, an increase of 17 per cent.

The amount of body and radiator solder also could increase from the present 13,500 tons to 15,750 tons, also a 17 per cent rise.

Commenting on overseas operations, Mr. Quinn said U. S. compacts may become one of our most

powerful competitive weapons in the international market. Compacts accounted for 47 per cent of exports last year, he declared, and the potential for growth in foreign markets is the same as that which has characterized the U. S. since 1920.

## GMAC Income Rises

General Motors Acceptance Corp. has reported net income for the first quarter of \$15.7 million, compared with \$12.1 million for the same 1960 period.

The figures include earnings of Motors Insurance Corp., a subsidiary, that had net earnings of \$3.8 in the first quarter. The 1960 first quarter net was \$1.2 million.

## EDITORS TOUR VOLKSWAGEN FACTORY



Hartley W. Barclay, editor and publisher of Automotive Industries, and E. C. Beaudet (left), managing editor of Iron Age Magazine, interviewing Dr. Heinz Nordhoff (right), president of Volkswagenwerk A. G., at Wolfsburg, Germany. Dr. Nordhoff revealed the plant was producing 3300 vehicles daily.

### Volkswagen Studies Gas Turbines

Special to Automotive Industries

Wolfsburg, Germany—A top official of Volkswagenwerk A.G. told an editor of AUTOMOTIVE INDUSTRIES Magazine that "Volkswagenwerk is engaged in research on automotive gas turbines just as many other large manufacturers of automotive engines are studying future potentials of such engines." Further information was not available. This is the first official report that engine research and development projects at Volkswagenwerk include studies of automotive gas turbines.

# NEWS

CONTINUED

## New Safety Car

Twenty-four built-in safety features have been displayed by Liberty Mutual Insurance Co. in their latest "crash-safe" experimental vehicle dubbed Survival Car II.

A conventional four-door sedan was used to show that in a major crash the occupants would receive only minimum injuries.

Safety features include lap and harness belts, roll bars, head rests and a flexible steering shaft that will buckle under the driver's weight. The rectangular wheel is said to prevent injuries to the driver's kneecaps.

Two high-backed titanium alloy "capsule" or bucket seats replace the conventional seat. Frank Crandell, chief engineer for the in-

surance company and designer of the car, said they would remain in place in head-on collisions at 30 mph. At much lower speeds, Mr. Crandell declared, front seats of a standard car are usually torn from the floor.

There also is a safety brake device that automatically switches hydraulic lines to provide brake action if a hydraulic line fails. An automatic fire-control system has been made a part of the engine.

## J. W. Douglas Named

John W. Douglas, president of Republic Foil, Inc., Danbury, Conn., has been elected president of the Aluminum Association.

## Ford Got \$462,500

Henry Ford, II, board chairman of Ford Motor Co., received \$462,500 in compensation last year and Robert S. McNamara, who resigned after two months as president, received \$386,667. Mr. McNamara is Secretary of Defense.

Mr. Ford received \$187,500 in salary and fees and \$275,000 in bonds. Mr. McNamara received \$141,667 in salary and a \$245,000 bonus.

Other Ford officials in top salary brackets were John Dykstra, recently named president, \$375,000; William T. Gossett, vice president and general counsel, \$360,000; John S. Bugas, vice president international group, \$347,500; and Irving A. Duffy, vice president, general products group, \$317,500.

Ford announced that last year its officers and directors received salaries and fees of \$2.7 million and bonuses of \$7 million. The bonuses are payable in four annual installments.

## U. S. Air Marks

In the last five months the United States has regained the lead in international aviation records according to the National Aeronautic Association.

Today the U. S. holds 113 of a total of 412 records compared with 103 for Russia. In November, 1960, Russia held 108 marks and the U. S. 98.

Five world maximum performance records, regardless of the type of aircraft, are all held by the U. S.



Capsule Chair in 'Crash-Safe' Car

# NEWS

CONTINUED

## Mutt's First Showing

The Army's new general-purpose carrier—Ford's "Mutt"—was recently put through its paces in the Ramapo Mountains of northern New Jersey. This was the first public showing of the quarter-ton personnel and cargo carrier, which Army Ordnance has designated the M-151 and which Ford Motor Co. has nicknamed the "Mutt" (military utility tactical truck).

Army Ordnance has ordered more than 7000 of these military trucks from Ford, and they are being assembled at Ford's Livonia, Mich., plant.

### 8 Years of Research

Frank S. Kipp, general operations manager of Ford's special military vehicles operations, was the main speaker at a luncheon preceding the impressive field demonstration. He said the Mutt represents over eight years of research and engineering by Ford with technical supervision by the Ordnance Tank Automotive Command. He added it is the first Army Ordnance wheeled vehicle produced initially from Ordnance production drawings, as well as the first wheeled vehicle to meet Army Ordnance's new higher-reliability goals.

The Mutt is lighter than its predecessor and more than six in. shorter. It also has a higher power-to-weight ratio, 30 per cent more cruising range on the same fuel load, improved riding comfort, and 26 per cent more cargo space, Mr. Kipp stated. It weighs 1000 lb less when rigged for air drop, he added.

As a cargo carrier, the 2347-lb vehicle can handle a load of 800 lb on cross-country terrain or 1200

lb on the highway. When fully loaded, it also will tow 1500 lb cross-country or 2000 lb on the highway.

As a personnel carrier, it can carry four soldiers and their combat equipment up a 60 per cent grade and over rough, open country, including fording of hard-bottom streams.

### Top Speed of 65 MPH

Top speed is 65 mph, and operating range is 300 miles.

The Mutt has a unitized body and frame of steel. Its wheelbase is 85 in., length 132 in., and width 62¼ in. It is powered by a 141.5-cu - in. four - cylinder ohv water cooled engine, weighing 247 lb, that has a maximum rating of 71 bhp at 3900 rpm.

Transmission is four-speed synchromesh type, combined with a single-speed transfer case. Shift into or out of four-wheel drive

can be made while the vehicle is in motion.

The truck has swing axles at the rear, and all four wheels are independently sprung on coil springs.

Other features of the Mutt include a 24-volt submersible and corrosion-resistant ignition system. With the addition of snorkels for air intake and exhaust, it will operate when submerged.

## Army Truck Order

Chrysler Corp. has been awarded a contract by the Army's Detroit Ordnance District for 2400 additional M-37 military trucks. Total value of the new order is about \$10 million.

The ¾-ton cross-country vehicles will be built at the Dodge truck assembly plant in Warren, Mich., beginning in July. The order brings the total of M-37 trucks built at Warren since 1949 to more than 80,000.

More than 300 supplier firms, including companies located in New York, Pennsylvania, Missouri and Tennessee, are expected to benefit from the contract. About 85 per cent of these firms have less than 500 employees and are located in distressed labor areas.



Officers, Civilians Inspect Mutt



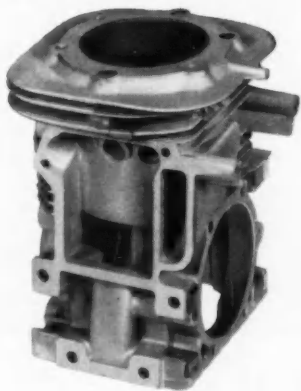
NOW AVAILABLE FOR SMALL-BORE  ENGINES!



## NEW SPINY-SURFACE CYLINDER LINERS LOCK TO ALUMINUM PERMANENTLY, SECURELY

Perfect Circle's patented Whirlcast liners are now offered in ID's as small as 2"

ALL SMALL ENGINES CAN NOW FEATURE  
PERFECT CIRCLE SPINY-SURFACE LINERS FOR  
GREATER STRENGTH AND DURABILITY



Now manufacturers of small engines can take advantage of the superior cast-iron cylinder liners used exclusively in the new die-cast aluminum passenger car engines.

Perfect Circle Whirlcast® liners were chosen for these new engines because of their patented spiny surface. When the block is cast, the aluminum interlocks with the roughly-textured spines to create the strongest bond ever devised. The liners won't pull loose under the severest stress.

For small-bore, outboard and industrial engines, this stronger bond makes a vital contribution to increased durability and performance. It prevents liner separation at the critical areas around the ports—prevents combustion deposits between cylinder and block and insures efficient heat transfer for the life of the engine.

Perfect Circle Whirlcast liners are now available with inside diameters as small as 2 inches.\* They are precision cast for uniform dimension and hardness, with micro-structure controlled to exacting specifications. For complete information contact your PC representative, or write: Mr. Harry May, Perfect Circle Corp., Hagerstown, Indiana.

\*ALSO AVAILABLE UP TO 12" IN DIAMETER  
FOR USE AS LININGS ON ALUMINUM  
BRAKE DRUMS.

CROSS SECTION (magnified 4 times) shows how liner spines lock into the die-cast aluminum. Surface is created by centrifugally casting liners in permanent molds coated with porous ceramic material.

# PERFECT CIRCLE

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**Du Pont DELRIN®**  
*acetal resins*

*one of Du Pont's versatile  
engineering materials*

**Ball seats  
of  
DELRIN®**



## **give "greased-for-life" joints**

For many 1961 cars, ball seats in a lubricated-for-life steering linkage are molded of Du Pont DELRIN acetal resin. This new steering system offers smoothness of operation and ease of handling not achieved with other steering linkages. A careful consideration of the functional requirements of ball seats in this application led to the choice of DELRIN.

First, the material chosen needed to have a low coefficient of friction against steel, and the static and dynamic coefficients of friction had to be about the same to give a smooth, even feel to steering. DELRIN has the required frictional properties.

Second, the material had to be tough over a wide range of temperatures (-40° to 250°F.). DELRIN is.

Third, the material had to be unaffected by any solvent action of the lubricant up to 250° F. DELRIN has the chemical resistance needed.

Fourth, the material had to be dimensionally stable under the load and in the environmental conditions encountered. DELRIN is.

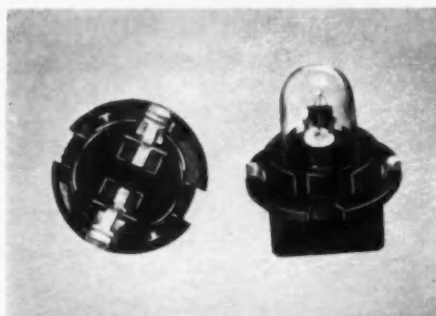
Severe laboratory and road tests proved that DELRIN acetal resin had the high strength and resilience necessary to maintain a permanent tight fit.

This is one example of the ways in which the remarkable properties of DELRIN are being used today to improve the performance and to lower the costs of automotive components.

There are more examples on facing page.



Coil assembly for automotive fuel pump is made of a single part of DELRIN, replacing a screw and two machined phenolic-laminate parts. Assembly is a simple, fast cold-heading operation which eliminates a tapping operation. DELRIN provides the superior heat resistance, toughness and dimensional stability required. (Molded by Arjay Mfg. Co., Vassar, Michigan, for Walbro Corp., Cass City, Michigan.)



Lamp socket molded of DELRIN is designed for use in dash lighting and other assemblies using printed circuits. It accommodates new socketless bulbs. DELRIN acetal resin provides the required high-temperature resistance, creep resistance, electrical properties and resilience... and does so at lower cost than other materials. (Lamp sockets are manufactured by Wade Electric Products Co., Sturgis, Michigan.)

## One-piece moldings of DELRIN® simplify design and lower assembly-line costs

One important variable in the cost equation is, of course, the cost of assembly and installation. In this area, DELRIN often makes possible design simplifications by the use of one-piece injection moldings instead of multi-part assemblies. The three products shown above illustrate the point.

For additional information on the properties and applications of DELRIN in the automotive field, mail the coupon below. The same coupon will bring you relevant information on any of Du Pont's versatile engineering materials.



Disc retainer guide of DELRIN replaces conventional stem and stem guide of bronze in foot and line check valves. Guide of DELRIN gives improved flow characteristics, reduced pressure drop, longer life... is designed for use up to 180°F. in water, oil or gasoline pumping installations. (Molded by Holman Manufacturing Co., for White Flomatic Division of Flomatic Corporation, both of Hoosick Falls, N. Y.)

POLYCHEMICALS DEPARTMENT



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... THROUGH CHEMISTRY

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acrylic resins

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PROBLEMS,  
TOO**

This masterpiece of engineering ingenuity\* was fidgety but fast . . . owners everywhere proudly stated, "It Sho Con-go."

We're not too proud of this rustic rig but we are proud of the fact that, for over 50 years, our designers, engineers and manufacturing facilities have played such an important part in the advancement of automotive riding comfort.

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**MATHER**

P. O. BOX 6695, TOLEDO, OHIO

\*The gravitational warp of the diametric transversal is directly opposed to proportionate conic force.





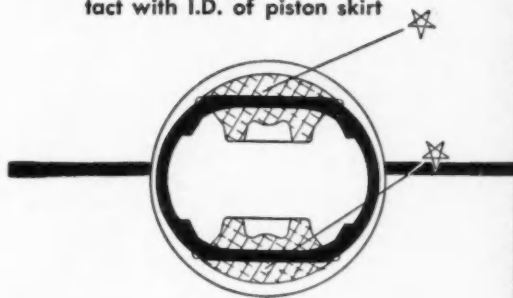
**Z** EXPERIENCE PROVES THE ENGINEERING LEADERSHIP OF "ZOLLNER PISTON" POWERED ENGINES

## Another Zollner Engineering Achievement in Cooperation with Engine Builders

### CLEAR--MATIC

#### STEEL TENSION MEMBER

Anchored only at pin bosses  
and cast in positive con-  
tact with I.D. of piston skirt



Automatically Maintains  
Uniform Effective Skirt  
Clearance at ALL Temperatures

#### COOLER RUNNING

20% greater section for  
heat conductivity

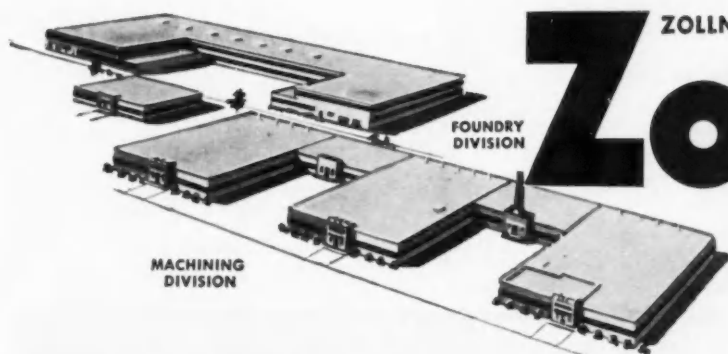
#### EXTRA DURABILITY

Greater section above pin  
bosses provides uncompromised  
strength for long life

### THE "ALL-TEMPERATURE" CONTROLLED EXPANSION PISTON



Design adaptable to full  
skirted or slipper type pistons



ZOLLNER CORPORATION • FORT WAYNE, IND.

# ZOLLNER

## HEAVY DUTY PISTONS

COMPLETE CO-OPERATION IN ENGINE DEVELOPMENT WITH THE FINEST PISTON FACILITIES

# FORD TRUCKS put up an even better front...



with  
**MOLDED  
FIBER  
GLASS**

Smart looking Ford trucks are permanent, practical,  
with **MOLDED FIBER GLASS** parts that

- ★ never rust nor corrode
- ★ never surrender to weather or time.

They'll look as fresh 10 years from now as today!

Won't dent or get out of shape . . . highly resistant to impacts. (Severe blows cause local damage only, easily and quickly repaired. No distortion of adjacent parts.)

Stronger than steel, pound for pound, and 40% lighter than equivalent sheet metal. Tooling is 50% faster, at 80% less cost.

Get complete information on having your designs custom molded of strong, lightweight **MOLDED FIBER GLASS**. The secret of MFG superiority is in our exclusive matched-metal-die molding process. Ask for free literature.



**MOLDED FIBER GLASS BODY COMPANY**

4611 Benefit Avenue—Ashtabula, Ohio

# NEWS

## FEATURES

### OTAC Offices Sought Centralized Functions at Arsenal Proposed

A proposal to centralize the Army's Ordnance Tank Automotive Command operations in Michigan will be considered by Congress later this month.

The operations are now divided between the arsenal in Centerline and an office building in Detroit, 22 miles distant.

If adopted, the proposal would mean that the OTAC functions in Detroit would be moved to a new office building to be constructed at the arsenal. Presently, about one-third of the employees in the Procurement and Production Section and one-third of those in the Repair and Supply Section are located in Detroit, with the remainder at the arsenal. The arsenal also has some personnel at the Detroit office.

#### Request for Funds

The proposal actually is a request for funds to construct the new building. The plans for the building were approved two years ago by Congress. However, no funds were allocated at that time.

What the change would mean to OTAC in terms of efficiency is obvious.

OTAC is composed of four main divisions, Research and Engineering, Procurement and Production, Repair and Supply and the Detroit Arsenal. The command's functions require a constant and simple

means of communication between these divisions. The present divided command does not provide these facilities.

For example, coded messages must be deciphered at the arsenal and taken to Detroit by messenger

because of security restrictions. Classified telephone conversations fall under the same regulations.

Another problem arose last October when the Dept. of Defense assigned the Military Automotive Supply Agency to move in with OTAC for the purpose of managing the procurement and distribution policies of all the military services. This has added 300 employees and compounded the communications problem.

#### COMPARATIVE HARDNESS TESTING METHOD



Local temperatures and hot spots on rapidly-moving engine parts such as pistons are measured by method of comparative hardness testing developed by Shell Research in England. Since original hardness of certain alloys changes when they are heated and cooled, Shell compares the two hardnesses and interprets the difference in terms of maximum temperature reached.

# AI TABLOID

Investigation of the heat resistance of platinum alloys containing rhodium, iridium, ruthenium, chromium, and aluminum by the bend-test method is discussed in an article translated from a Russian metallurgy journal.

A summary of physical property data on martensitic stainless steels is now available. The report lists in tables and graphs the chemical compositions and other properties of 100 commonly used stainless steels.

The effectiveness of ultrasonic techniques in determining the strength of ceramic-metal bonds has been evaluated by the Air Force. It is part of a study of the ability of protective ceramic coatings on metal surfaces to withstand violent mechanical shock.

The effects of hot forging on three boron-treated steels are evaluated in one of four Army research reports.

The status of research and development of aircraft and missile steels having tensile strengths above 260,000 psi is reviewed in an Air Force report.

A method for gauging the fracture toughness of thin sheet metals is described in one of three reports of Government-sponsored research on metals testing. The other two reports deal with fatigue properties of ultra-high strength steel and crack propagation tests of high-strength of sheet metals.

A device that can subject alloys for use in aircraft construction to 100,000 atmospheres pressure at temperatures of more than 1500 C has been designed and built for the Air Force.

Shipments of galvanized steel sheets in 1960 rose by 10 per cent over 1959 to a record high of 3,056,996 net tons.

The corrosive effects of nitrogen tetroxide on mild steel, aluminum, stainless steels, and titanium are discussed in one of three research reports. The two other reports are on the effects of borane toxicity and the stress corrosion behavior of titanium and titanium alloys.

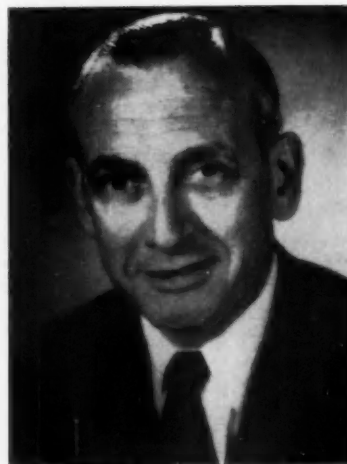
A high-speed impact machine calibrated to test parachute components at high rates of loading has been developed for the Air Force. The machine is capable of rupturing materials of up to 10,000 lb static breaking strength at velocities of from 200 to 750 ft per second.

An investigation of the thermal properties of metals in missiles and rockets and a study of means to devise protective measures for such metals against the severe temperatures to which they are subjected are described in two reports.

A high-speed electronic shutter that enables a camera to take up to 12 pictures in sequence of a self-illuminating subject has been developed for the Air Force. The shutter, which uses an image tube and an electrostatic lens, is described in a research report.

Minimum toughness requirements for high-strength steels are discussed in one of four reports of government-sponsored metals research. The three other reports are on creep collapse under high temperature and external pressure, column action during creep buckling, and creep buckling of titanium alloys columns.

The technique of explosive metalworking is explained in one of four memorandums on metalworking. The three other memorandums are on metalworking processes based on the sudden release of electrical energy; unconventional methods of machining, and large-size furnaces for heat treating assemblies.



Dr. Claude L. Clark, Timken Roller Bearing Co., will receive the Albert Sauveur Achievement Award of the American Society of Metals for outstanding accomplishments effecting a marked basic advance in knowledge of metalworking technology.

## Hydrofoil Tests

The Maritime Administration is seeking an operator to test the largest hydrofoil vessel this summer.

The 80-ton, 104-ft craft is nearing completion by Dynamic Developments, Inc., a subsidiary of the Grumman Aircraft Engineering Corp.

Engineers claim the \$5 million craft will be able to do 60 knots and carry 80 passengers.

The new vessel will be named for the late C. R. Denison, scientist-engineer, for his part in the hydrofoil development as project engineer for the Maritime Administration.

Thomas E. Stakem, Maritime Administrator, said the test operator would be selected from those submitting proposals prior to May 15. He expects the testing period to last 18 months.



### Pontiac Nickel Plating

A double nickel plating process on front and rear bumpers is providing Pontiac and Tempest cars with unprecedented chrome quality, according to S. E. Knudsen, Pontiac Motor Div. general manager.

Called the duplex nickel process, the treatment features application of two layers of nickel over a cover plate prior to the final coating of conventional chrome.

"The layer of copper is buffed to a high lustre," Mr. Knudsen explained. "This contributes to an exceptional mirror-bright finish on the completed bumper."

Pontiac's electro-plating plant, in conjunction with the division's reliability research program, recently put into operation a pilot line for the evaluation of new plating processes. Electronic test equipment checks plating density to one millionth of an inch and at least one set of bumpers a day are subjected to an 18-hour salt spray test to determine chrome durability.

### Record Vauxhall Profit

Vauxhall Motors, Ltd., General Motors' wholly-owned subsidiary in England, has reported that both turnover and profits vaulted in 1960 to set new records. Vauxhall also noted a striking variation in performance between the first and second halves of a difficult year for the auto industry.

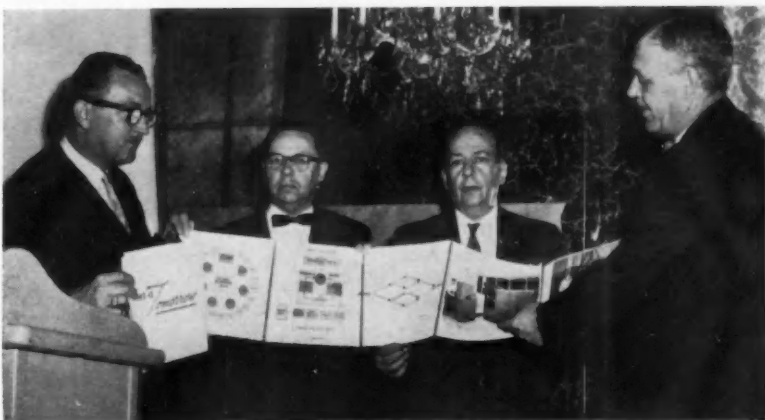
Sales of \$380.8 million were up five per cent over 1959 and new profits, after taxes, were \$20 million, an increase of \$1.96 million over the previous year.

The first half of 1960 was period of high volume, Vauxhall said. This provided a cushion for lower volume and rising costs in the second half. Vauxhall noted record sales of 245,981 vehicles.

### DETROIT EDITOR RECEIVES AWARD



Joseph Geschelin, Detroit editor of *Automotive Industries*, is congratulated by Dr. Herbert F. Roemmele, dean of Cooper-Union University, after Geschelin was presented with distinguished technical service award of the Greater New York Chapter, American Society of Tool and Manufacturing Engineers. Also shown are Harold Cooper, director of manufacturing standards, Chrysler Corp. (left) and Dr. P. F. Martinuzzi, head of the mechanical engineering department at Stevens Institute of Technology, both of whom received awards.



Athel F. Denham, (right), of Detroit, shows exhibits as part of his technical lecture on modern trends in engineering communications at ASTME meeting. From left are Hartley W. Barclay, editor and publisher of *Automotive Industries*, who was toastmaster at banquet in Hotel New Yorker; and Harold Cooper. Mr. Denham also received technical service award. Alfred Sampter, chairman of the Tool Engineers' Day program, is second from right.



# EUROPEAN ROUND-UP

By DAVID SCOTT • Special Correspondent

British Ford has originated a method for direct valve actuation from an overhead camshaft without an intervening rocker arm. The valve guide extends upward through the head, and its OD is machined to carry a coaxial sleeve that serves as a tappet. The sleeve is shouldered to bear against the spring, and is locked to the valve stem by a slotted washer. A thrust pad contacting the cam face is recessed in the sleeve head, with clearance adjusted by a shim under the pad.

Another new valve system has been patented by Porsche. This is a springless desmodromic arrangement for use in high-speed engines, and incorporates a centrifugal governor controlling a hydraulic piston that increases and slightly advances the valve stroke as speed rises. The piston alters the pivot point of the cam operating the rocker in the complex linkage between pushrod and valve stem.

*Employing an optical illusion to extend visibility from inside a car, a Swedish scientist has experimented with tapered glass for the front side windows, combined with thin steel struts replacing the normal windshield pillars. The prismatic effect of the glass makes the struts invisible, giving the driver an uninterrupted field of view through 180 degrees.*

Peugeot has introduced fuel injection as an option for the 98.6-

cu in. engine of its new 404 model. Compression ratio is boosted from 7.2 to 8.5, and maximum power is increased from 72 to 85 hp at the same 5500 rpm. The 45-degree tilt of the cylinder block simplifies installation of the injection equipment.

Intended for measuring the adhesion of galvanic coatings and electroplating among other applications, an ultracentrifuge with a magnetically-suspended bearingless rotor that can run up to several million rpm has been developed in Czechoslovakia. Shaft ends are supported by steel balls floating freely in the fields of powerful electromagnets, and the rotor is inductively driven and operates in a vacuum.

## Protects Press Dies

An electronics company in London has produced a device to protect press dies and punches from damage in the event of faulty ejection of the workpiece. The press is cycled by a time-controlled relay actuated by the outgoing work passing over a detector head. When the pressing is not ejected within the pre-set time the relay trips and automatically opens the control circuit.

Designed as a mobile home or board room for traveling executives, a luxury motorized caravan based on a mini-bus is being marketed by Daimler-Benz. Seats con-

vert into two single beds, and a five-kw generator powers the refrigerator, stove, fluorescent lights and heating units. Price in Germany ranges to \$12,500 according to specifications.

American Motors has opened an assembly plant on Malta to produce Ramblers for the North African and Middle East markets.

*Intra-European operations continue to spread. Perkins has formed a new company in Italy to improve technical and field services for its Diesels in that country, and the Czechs are negotiating the assembly of Skoda cars in Austria.*

There are more Anglo-American links too. Lansing Bagnall fork trucks are to be made by the Towmotor Corp. in Cleveland. Simms will supply fuel injection equipment to U. S. Ford for its new 6000 tractor, and Burman will provide steering gears for the Ford Cardinal to be built in Germany.

The current scramble for sales by Europe's expanding auto industries has started a wave of price cuts. In addition to lowering their American prices, many Italian, French and English manufacturers have followed suit in other markets.

## 20 Per Cent Price Cut

These include smaller producers like Alfa Romeo, which has knocked substantial sums off its cars sold in Britain. Skoda has sliced 20 per cent off the basic price of the Octavia sedan in the United Kingdom. Its landed price now equals about \$670, far less than the before-tax tag on any British car, and it retails for considerably less than even the Volkswagen or Dauphine among imports that carry 30 per cent duty.

United Kingdom industry is making a major probe of the Russian market at the British Trade Fair that opens in Moscow on May 19. Automotive companies represented include Jaguar, Rootes, Standard-Triumph, Pressed Steel, Fisher & Ludlow, Lansing Bagnall, Dunlop, Lucas and Girling. Over 600 manufacturers are taking part, making this the largest British overseas exhibition ever staged.

### Army Tests Muskrat

American Motors Corp. has delivered to Army ordnance officials the first of a new type military vehicle, the SM 531, a  $\frac{3}{4}$ -ton cargo and personnel carrier powered by the Rambler Classic aluminum engine.

Named the "Muskrat," the versatile vehicle is one of several which will be furnished to the Army and Marine Corps for testing under field conditions, according to J. W. Eskridge, vice president and general manager of AMC's Special Products Div.

#### 60 MPH on Highway

The Muskrat can travel over all types of terrain due to its large tires and wheels and high ground clearance. It climbs grades in excess of 60 percent. Its highway

speed is over 60 mph, fully loaded, and its range is over 400 mi without refueling.

Its cargo capacity for rough terrain is 1500 lbs. plus crew. As a personnel carrier, it will transport a driver and seven passengers with full field equipment. It is easily converted to a mobile field ambulance, carrying four litters, driver and an attendant. The vehicle's light weight and compactness permits parachute or helicopter delivery.

In addition to the die cast aluminum engine block and the all-aluminum body, castings for the brake drums, transmission case, transfer case and front and rear axles also are of aluminum.

The Muskrat has a wheelbase of 82 in. and overall length of 148 in. It is 82 in. wide and 43 in. high over the fenders. Ground clearance is 13 in.

The Muskrat is of unique design and adaptable to a variety of military applications, Mr. Eskridge said. It is capable of floating without prior preparation, and is designed to permit swimming across inland streams and waterways under full load. It propels itself in protected waters at an approximate speed of three mph.

The vehicle's powerplant is positioned seven inches off center to the right permitting the driver to sit along its left side, thus lending to the compact concept of the design. The front and rear drive units are uniquely split so that the differential assemblies are mounted to the body from the inside of the vehicle. Axle tubes and shafts are installed and secured from outside the vehicle body.

### Army Engine Order

Continental Motors Corp. has received a \$1 million contract from the Detroit Army Ordnance District to procure materials needed to produce 3995 multi-fuel engines. The award will enable Continental to place commitments for long lead time production supplies such as forgings, castings and special tooling.

The engines will power the latest version of the Army's M-44 Series  $2\frac{1}{2}$  ton tactical trucks.

Designated the LDS-427-2 (liquid-cooled, Diesel, supercharged), the engine operates efficiently on kerosene, gasoline, Diesel fuel, JP-4 fuel, or a combination of those fuels.

Continental also was awarded an increase of \$310,340 for production of 20 1000-hp engines used to power the army M-88 tank recovery vehicle.



'Muskrat' Fords River in Army Test

# DESIGN FOR SUPERIOR PERFORMANCE

*with Lord  
vibration/shock/noise control*



## **how Lord can help improve performance**

High-strength elastomeric mountings and joints are custom designed to control dynamic disturbances, reduce noise transmission, accommodate relative motion . . . thereby upgrading performance, reliability, acceptance. These compact, easy-to-install units resist severe conditions, often outlast metal parts, never need lubrication.

## **on lift trucks . . .**

- Engine mountings isolate engine disturbances.
- Floorboard mountings, seat mountings, steering wheel bushings and accelerator pedal mountings give driver fatigue-free comfort.
- Rear axle springs (lubrication-free pivots) assure smoother ride.
- Axle bumpers and mast bumpers cushion operating shocks.
- Actuating cylinder bushings eliminate binding and lubrication.
- Radio mounting systems protect electronic components.

See us at the Design Engineering Show — Booth 912, Cobo Hall

**Lift trucks** can be designed for greater operator comfort, lower maintenance requirements and longer component service life.

Lord-engineered vibration control is a proved route to this better performance . . . and to the competitive edge it will give your truck.

Now, while that new model is on the drawing boards, is the time to consider vibration control, the time to talk to a Lord engineer. You will find him knowledgeable on lift trucks, quick to grasp your problem, able to offer authoritative assistance on vibration/shock/noise control.

Lord engineers are ready to help you in your effort to design for superior performance. Contact your nearest Lord Field Engineering Office or the Home Office, Erie, Pennsylvania.



## **FIELD ENGINEERING OFFICES**

ATLANTA, GEORGIA - Cedar 7-9247	LOS ANGELES, CAL. - Hollywood 4-7593
BOSTON, MASS. - Hancock 6-9135	NEW YORK, N. Y. (Paramus, N. J.)
CHICAGO, ILL. - Michigan 2-6010	New York City - Bryant 9-8042
DALLAS, TEXAS - Riverside 1-3392	Paramus, N. J. - Diamond 9-5333
DAYTON, OHIO - Baldwin 4-0351	PHILADELPHIA, PA. - Pennypacker 5-3559
DETROIT, MICH. - Diamond 1-4340	SAN FRANCISCO, CAL. - Exbrook 7-6280
KANSAS CITY, MO. - Westport 1-0138	WINTER PARK, FLA. - Midway 7-5501

"In Canada—Railway & Power Engineering Corporation Limited"

**LORD MANUFACTURING COMPANY • ERIE, PA.**



# MEIN

## IN THE NEWS



**Warner Electric Brake & Clutch Co.**—Leland W. Ruffner has been appointed manager - engineering and research.



**Fredrick B. Stevens, Inc., Metal Finishing Div.**—John W. Manquen has been named technical director.



**A. O. Smith Corp.**—Peter S. Blake has been named manufacturing director of automotive and railway products.



**Garlock, Inc., Manufacturing Div.**—C. Edward Bellow has been appointed manager.



**Oliver Corp.**—Frank J. Pryatel has been promoted to manager of the Charles City, Ia., wheel tractor plant.



General Dynamics Electronics Commercial Products Div.—**John W. Carley** has been appointed manager of automotive products.

**Whiting Corp.**—**W. R. Jaeschke** has been named head of the metallurgical consulting service; **C. McGlone** has been named manager of cupolas and accessories group; **R. A. Muhleman** has been appointed manager, furnaces, ladles and pulverizers group, and **C. W. Vokac** has been named manager, hydro-arc electric furnaces group.

**Borg-Warner Service Parts Co.**—**C. Gregg Geiger** has been appointed sales manager.

**Norton Co.**—**George A. Garrison** has been appointed purchasing agent. He will report to **George D. Seguin**, general purchasing agent.

**Crucible Steel Co. of America**—**John E. Holt** has been promoted to assistant to the president.

**Humble Oil & Refining Co., Esso Div.**—**Arthur A. Draeger** has been named manager of economic and marketing research.

**Dana Corp., Toledo Div.**—**Charles W. Vaughn** has been appointed general production superintendent.

**General Motors Corp.**—**Aloysius F. Power** has been elected a vice president and general counsel.

**Ford Motor Co., Automotive Assembly Div.**—**D. J. Bastian** has been promoted to general manufacturing manager.

**Jones & Laughlin Steel Corp., Stainless and Strip Div.**—**John J. O'Connor** has been appointed general manager for production planning and sales service.

**Williams Research Corp.**—**John F. Jones** has been promoted to engineering vice president.

**Willys Motors, Inc.**—**Ward M. Sales** has been promoted to controller.

**General Motors Corp., AC Spark Plug Div.**—**Kenneth M. Tebo** has been named director of management control and analysis and **Robert L. Herstein** has been promoted to assistant controller.

**Hyster Co.**—**William H. Peterson** (far left) has been named manager of training and planning and **Charles A. Richmond** has been appointed personnel manager, General Office Group.

**Humble Oil & Refining Co., Enjay Chemical Div.**—**S. R. Shuart** has been promoted to full-time development of the butyl tire program and **W. P. FitzGerald** replaces him as technical service co-ordinator.

**Clum Mfg. Co.**—**Ervin A. Koth** has been named head of the testing laboratories; **Thomas P. Osborne** has been named head of materials and production scheduling, and **William S. Smith** has been appointed project engineer.

**Budd Co., Automotive Div.**—**Fredrick B. Lutz** has been promoted to technical staff assistant to the president; **William M. Ramsay** has been appointed manager of materials and purchasing, and **Clarence M. Ehrhardt** has been named office manager.

### Necrology

**Charles D. Todd**, 46, president of the Wayne Foundry & Stamping Co., died April 26 in Detroit.

**George W. Codrington**, 74, retired General Motors Corp. vice president and general manager of the Cleveland Diesel Engine Div., died April 25 in Daytona Beach, Fla.

**Lynn A. Fill**, 70, retired director of engineering for Motor Products Co., died April 24 in Detroit.

**George E. Hodgins**, 59, head of plant engineering at General Motors Corp.'s proving grounds in Milford, Mich., died April 24 in Ann Arbor, Mich.

**Erwin C. Horton**, 74, consulting engineer for Trico Products Corp., died April 20 in Buffalo, N. Y.

**Joseph Brennan**, 58, chief metallurgist of the Union Carbide Metals Co., died April 19 in Niagara Falls, N. Y.

**Philip J. Kent**, 70, consulting engineer for the Stewart-Warner Corp., died April 16 in Detroit.



# FASTENER BRIEFS

RUSSELL, BURDSALL & WARD BOLT AND NUT COMPANY



## Technical-ities

By Fred E. Graves

### Fastening of joints in corrosive environment

For a fastener to stand up in a corrosive environment it must either be coated, or made from an anti-corrosive metal.

#### THE METALLIC COATINGS

The "workhorse" applications are satisfied most economically with SAE Grade 2 or Grade 5 fasteners. Required outdoor durability is achieved with a plated or a hot galvanized finish. Hot galvanizing complicates good thread fits, costs more than plating in the popular size range, but gives much greater protection than any commercial plating.

A heavy galvanized coating is not recommended on highly stressed fasteners. If you need the high strength of Grade 5 bolts and want them corrosion-resistant, zinc plating should be your first choice. Certain conditions may require cadmium, nickel or copper plate.

#### THE ENDURING METALS

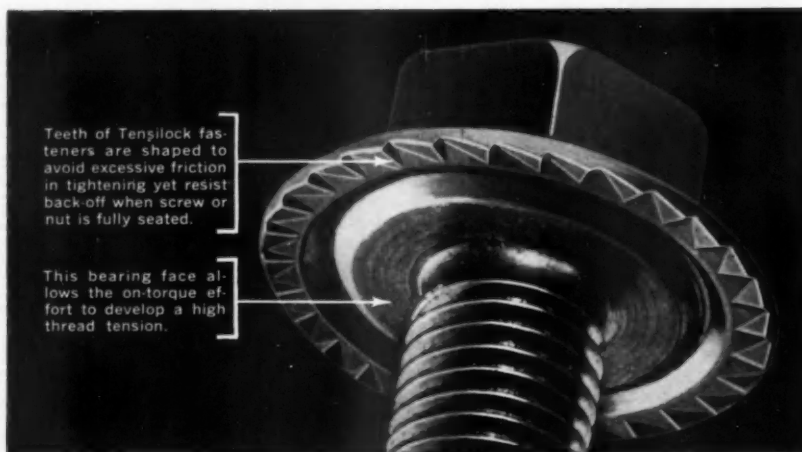
While each metal poses problems in certain applications, stainless steel, aluminum, and silicon bronze all offer distinct advantages.

Silicon bronze is popular for electrical uses due to its unusual strength, resistance to stress-corrosion, good conductivity.

Aluminum fasteners afford light weight as well as excellent conductivity. Anodized, they provide various colors; better corrosion resistance.

Widely used for fasteners, the 18-8 grade stainless steel assures good strength and excellent corrosion resistance in most atmospheres.

## How Tensilock® Screws clamp tight, lock tight



**T**ENSILOCK screws belong in the same league as high strength hex screws. With the same on-torque effort, the Tensilock units develop about 90% of the thread tension usually developed by the latter. Thus, they *both* make strong joints.

#### THREAD TENSION = CLAMPING FORCE

In theory, the higher the thread tension, the stronger the joint and the higher the inherent ability of the fastener to stay tight. In practice,

Screw Diameter		1/4	3/8	1/2
Thread Tension (lbs.)	Tensilock	2,750	6,750	12,400
	High Strength Hex	2,975	7,250	13,300
On Torque (inch lbs.)	Both	120	420	1,000
Off Torque (inch lbs.)	Tensilock	150	525	1,250
	High Strength Hex	95	330	800

you derive these benefits by torquing a high strength screw close to its *yield strength*. But what if you need high thread tension plus *extra* assurance that joints will stay tight? Then you have a job for Tensilock

units. Not only do they develop the high thread tension, but also have an extra (and *integral*) locking device.

#### OFF-TORQUE = LOCKING POWER

By design, loosening torque of Tensilock fasteners exceeds tightening torque by 25% or more. This is an effective "lock." It gives that extra margin of safety against vibratory loosening.

To sum up: RB&W's Tensilock screws are stronger than Low Carbon Hex Screws; compare with High Strength Hex Screws in clamping force; are superior to them in locking action. Suggestion: For a strong locking *bolt*, use with Tensilock Nut. Send for Bulletin TL-2. Russell, Burdsall & Ward Bolt and Nut Company, Port Chester, N. Y.



Plants at: Port Chester, N. Y.; Coraopolis, Pa.; Rock Falls, Ill.; Los Angeles, Calif. Sales office and warehouse at: San Francisco, Calif. Additional sales offices at: Ardmore (Phila.), Pa.; Pittsburgh; Detroit; Chicago; Dallas.

an Editorial



## How to Build a Boom

**R**ECENTLY MORE THAN 60 EDITORS from the United States flew to Germany as guests of Volkswagen executives. As a member of this group, I shared in visits to all major departments of two of the four Volkswagen plants. The seven-day trip included visits to other major business and industrial centers in Germany in addition to Wolfsburg and Hannover where Volkswagen passenger car and truck production is concentrated.

THROUGHOUT ALL OF THE CITIES in Western Germany it was quite evident that a tremendous business boom is now well established. Fewer than one per cent of Western Germany's workers are jobless, we were told. New super-highways, town and country homes, multiple family dwellings, and business and commercial buildings are being built in almost every city visited. American exports to Western Germany are up over previous levels, with further increases looming ahead.

IN THE VOLKSWAGEN FACTORY at Wolfsburg more than 37,000 persons are employed; in Hannover, more than 14,000; and in Kassel, at the spare parts and Vw transmission plant, 10,000 are employed. At Braunschweig, another Vw group of 5000 produces front end assemblies.

WORKERS USE LARGE NUMBERS of American-made machine tools, with additional multi-million dollar American machine tool shipments scheduled for delivery through coming months. American-made steel body sheets are conspicuous among production materials inventories. Dr. Heinz Nordhoff told the visiting editors that it is a Vw company policy to buy many types of machine tools and materials in the United States, in preference to other sources.

GERMAN PROSPERITY MAY HELP to speed up economic recovery in the United States. It certainly helped to reduce the severity of the economic decline here in 1960. But the most important thing Germany could send us would be a bright and fresh view of the formula for booming business that is typical of that country now. Putting items of information together it seemed to me that this formula consisted of such things as the following. Factory employees at Vw set an astounding high standard for enthusiasm in their work. There is little, if any, bickering about grievances. Factory workers are happy in appearance, energetic in their work, respectful to their supervisors and enjoy many social activities in their home life seldom seen in American plant city residential areas.

THERE IS A LESSON HERE, in "How to Build a Boom." Adjust taxes so that there are better incentives for management to buy and use the latest new equipment. Arrange employee relations so that management and labor can really cooperate. Adopt governmental policies that encourage rather than discourage production and enterprise. Develop exports so that the foreign markets multiply important sales potentials. Reduce excessive governmental regulation of manufacturing. Added up, these policies applied in the United States would go far to restore boom conditions here. Why should we not apply the same policies, here in the United States, that we have recommended and helped to develop in Western Germany? Or should we all stand idly by while more and more American manufacturers open branch plants or move their production entirely to Germany? Such reflections come into anyone's thoughts after visiting Vw. Perhaps Vw has done America a great favor by providing such a massive, direct view of this dynamic panorama of economic progress.

*Henry W Barclay*

Editor and Publisher



## FOAMED-IN-PLACE, RIGID URETHANE

... one product answers five automotive needs

Voracel® foamed-in-place rigid urethane can show definite economic advantages over cut-and-paste batt applications. These advantages are: *insulation, structural support, sound deadening, "pocket sealing," and surface protection.* Application of Voracel can be accomplished by either a spray or pour operation.

Voracel is the Dow trademark for the rigid urethane foam resulting from the interaction of Voranol® urethane polyethers and Voranate® isocyanate adducts.

Although new on the automotive scene, Voracel shows excellent results in strengthening sheet metal, especially when it is foamed in place between two sheets. Exceptional ease of application, good adherence to metal, and high resistance to alkali, gasoline, and other common automotive mate-

rials indicate its use as lining for hoods and other sheet-metal areas. Voracel can be used to inhibit corrosion in enclosed areas such as rocker panels. For information, call or write to the Dow sales office nearest you.

**ENGINE COOLING** Ebullient cooling for passenger cars is under intensive research at Dow's Automotive Chemicals Laboratory and seems headed for broad use because of its obvious advantages. The increased efficiency of a vapor system is expected to allow smaller radiators and more freedom of placement—for example, under the floor or in the trunk. This thought is intriguing to designers!

**DEGREASING** Chlorothene® NU specially inhibited 1,1,1-trichloroethane is continuing to make news in on-the-line cold degreasing because of its safety and efficiency. Chlorothene NU

combines the property of low toxicity and *no* fire or flash point, as measured by standard methods. And corrosion-prone white metals show a high tolerance for Chlorothene NU.

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# Automotive Plastics Uses Spurred by **SPI**

*The Society of the Plastics Industry, Inc.  
Teams with Automakers... to Provide...  
Right Materials for Right Job*

*By*

**Russell C. Weigel**

President and Director, SPI



Assistant General Manager  
Polychemicals Dept.  
E. I. du Pont de Nemours & Co., Inc.

**E**ACH year for more than a decade, the plastics industry has cooperated with the automotive industry through technical committees and other channels of communication to solve common problems important to each field. This kind of cooperation has increased substantially year by year, and has included development of technical standards and specifications, improvements in nomenclature, advances in design and application techniques, educational aids and methods of forming and processing.

The results were displayed in part, at the 1960 National Automobile Show, where an extensive array of automotive plastics parts was exhibited.

Each automotive part displayed at this exhibit won its place only after the most rigorous entrance examination and intense competition with other materials. Each part brought with it impressive qualifications relating to performance, style, economy, or some other factor demanded by the engineers and designers of the automotive industry.

The versatility of plastics and the spectrum of properties available to the engineer and designer today have led to the increased use of plastics in automotive engineering. Today we see more than twenty pounds of plastic materials used in the average automobile, where twenty years ago only a very small fraction of this amount was used.

Not only do plastics provide a wide range of properties, but they also have brought important savings to manufacturers. The future holds excellent prospects for further economic benefits to users of plastics.

Tomorrow's uses, I believe, are limited only by man's ingenuity, for the one quality of plastics that links them together philosophically, is the fact that having been made by man, they can be altered and modified to fit the broadest range of property requirements.

Nor is the automotive industry limited in its future planning by the materials or forming processes known today. The likelihood is strong that the next decade will see exciting innovations both in materials and in processing.

The effort of "Automotive Industries" in highlighting the con-

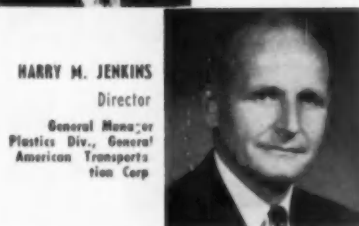


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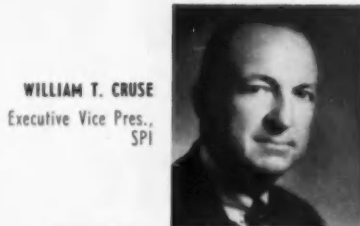
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# SPI

## DIVISIONS ACTIVE IN AUTOMOTIVE INDUSTRY AIDS

Cellular Plastics	Epoxy Resin Formulators	Fluorocarbons	Industrial Container	Machinery	Mold Makers	Vinyl Film Manufacturers	Molders' Management
Plastics for Tooling	Polyethylene Film	Profile Extruders	Reinforced Plastics	Sheet Forming	Thermoplastics Structures	Vinyl Dispersions	Vinyl-Metal Laminators Institute

## SPI COMMITTEES ACTIVE IN AUTOMOTIVE COOPERATION

Educational	Engineering and Technical	Fire Prevention	Injection Molding Machinery Standards	Safety	Polyethylene Construction, Industrial, and Agricultural Applications
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## ACTIVITIES OF COOPERATION

Plastics Engineering Handbook	Technical Conferences and Meetings	Standards	Research	Literature	Sections
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tributions of the plastics industry in basic materials engineering is most welcome, not only to The Society of the Plastics Industry, Inc. as a whole, but to its more than 2,500 members.

The Society of the Plastics Industry, with a bagful of materials little more than two decades old (and some promising youngsters), has made an adventurous jump into the automotive market. Quarterbacked by some of the best brains in the

business, it has achieved remarkable success in selling plastics on the basis of merit and not merely as substitute materials. The Society has given the automotive engineer, designer and business executive a sound picture of how plastics, favorable for production applications, can and should be used. Additionally, generous doses of information going to material producers and fabricators have led to both improved products and more effective uses. ■



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Cellular Plastics Div.  
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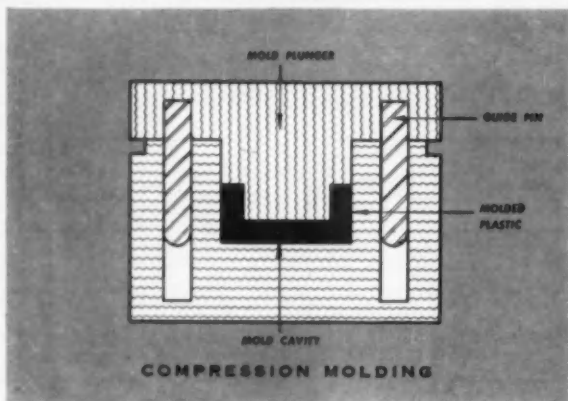
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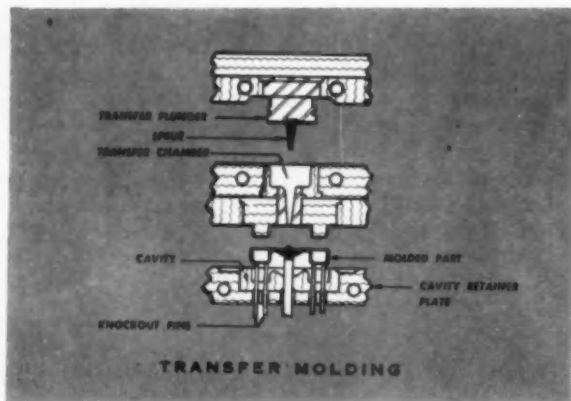
## PROCESSING



Compression molding is the most common method of forming thermosetting materials. It is not generally used for thermoplastics.

Compression molding is simply the squeezing of a material into a desired shape by application of heat and pressure to the material in a mold.

Plastic molding powder, mixed with such materials or fillers as woodflour, cellulose and asbestos to strengthen or give other added qualities to the finished product, is put directly into the open mold cavity. The mold is then closed, pressing down on the plastic and causing it to flow throughout the mold. It is while the heated mold is closed that the thermosetting material undergoes a chemical change which permanently hardens it into the shape of the mold. The three compression molding factors—pressure, temperature and time the mold is closed—vary with the design of the finished article and the material being molded.



Transfer molding is most generally used for thermosetting plastics.

This method is like compression molding in that the plastic is cured into an infusible state in a mold under heat and pressure. It differs from compression molding in that the plastic is heated to a point of plasticity before it reaches the mold and is forced into a closed mold by means of an hydraulically-operated plunger.

Transfer molding was developed to facilitate the molding of intricate products with small deep holes or numerous metal inserts. The dry molding compound used in compression molding sometimes disturbs the position of the metal inserts and the pins which form the holes. The liquefied plastic material in transfer molding flows around these metal parts without causing them to shift position.

## Automotive Plastics Review

By Norman M. Lloyd  
MARKETS EDITOR

A study of recent reports of various SPI committees and divisions indicates the remarkable range of subjects in which interest is shown. Just a few include: Food and Drug Administration rulings on plastics, U. S. Tariff negotiations, Department of Commerce standards, building costs, education, fire prevention and traffic rates.

Planned parenthood of standards and effective product fulfillment rests with the major divisions of SPI. Intensive efforts at this level to improve communications between the plastics industry and the automakers have paid off in rapidly-built markets for new materials and increasing demands for some of the well-established plastics.

The following reports by some divisional Chairmen clearly indicate that the SPI is determined to remain sound and competitive in the automotive market place:

### EPOXY FORMULATORS DIVISION

Donald Roon, Chairman

**T**HE Epoxy Resin Formulators Division of the SPI is a voluntary membership group composed of 20 company members whose principal products are based on epoxy resins.

Products fall mainly into three basic categories—adhesives, electrical insulating products, and plastic tooling materials. Each of these product classes is finding expanded usage in the automotive industry.

As the use of formulated epoxy resins has become widespread in the automotive industry, there has developed a growing need for more uniform test methods to serve quality control, comparison of product data at the user level, and the development of performance standards. Many technical bodies and their committees, such as ASTM, ASTME, SPE, and the SPI, have tackled these problem areas with significant results. ERF members, in most cases, have played important roles as members of these groups and committees.

Another ERF Division project well under way is the adoption of uniform test methods under which technical data can be prepared and disseminated through members for ultimate benefit of automotive customers.

Formulated epoxies and the chemicals used as hardeners, like most industrial chemicals, are safe materials if properly handled and used. On the other hand, if they are used without proper facilities and precautions, problems can occur.



The ERF early recognized the need for a clear, non-technical bulletin which would describe the most accepted methods and techniques for the safe handling of these compounds. Working closely with the automotive industry, such a report now has been completed by SPI for dissemination through Division members to end users of formulated epoxies.

Education is another area of vital concern to the ERF Division. Members have sponsored numerous seminars, in-plant training programs etc., and have cooperated extensively with such universities as Purdue, where intensive courses currently are being offered.

Although plastic tooling remains as the largest end use for formulated epoxies, the increasing interest shown in this class as adhesives and electrical insulating materials will tie the ERF Division even closer to the automotive industry.

## CELLULAR PLASTICS DIVISION

*Samuel Steingiser, Chairman*

**T**HE importance of the automotive industry as a major user of cellular plastics was recognized early in 1954. Since that time, the Cellular Plastics Division of the SPI has worked closely with various segments of this vast and complex market.

Initial efforts were technical in nature, developing standards for the effective use of cellular products in such automotive applications as topper pads, safety padding, visors, headliners, arm rests, and eventually full-depth seating. Due to the close cooperation between vehicle manufacturers and the Cellular Plastics Division, the resulting uniform methods of test and standards of quality have been generally accepted by the automotive industry. These efforts result in SPI-developed standards which are promulgated through the proper ASTM committee and finally published in the SAE Handbook.

Division and sub-committee meetings are scheduled at reasonable intervals in Detroit for the convenience of automotive specialists. Discussion, at these sessions, ranges from the technical to the commercial.

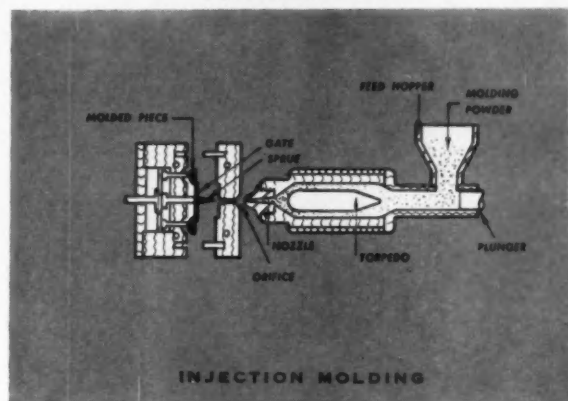
The Division sponsors several annual conferences, two of which are specifically concerned with the automotive industry. The importance of cellular materials and products to the automotive industry was demonstrated by the record attendance at the last summer's automotive meeting.

## VINYL-METAL LAMINATORS INSTITUTE

*Larry Dwyer, Chairman*

**A**NOTHER important activity of the SPI is the Vinyl Metal Laminators Institute composed of vinyl metal laminators, vinyl film manufacturers,

## PROCESSING

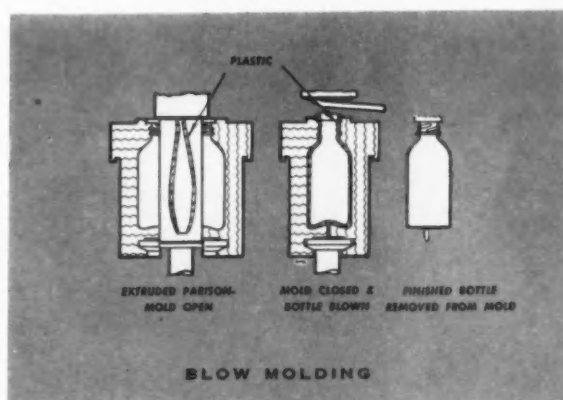


Injection is the principal method of forming thermoplastic materials. Modifications of the injection process are sometimes used for thermosetting plastics.

In injection molding, plastic material is put into a hopper which feeds into a heating chamber. A plunger pushes the plastic through this long heating chamber where the material is softened to a fluid state. At the end of this chamber there is a nozzle which abuts firmly against an opening into a cool, closed mold. The fluid plastic is forced at high pressure through this nozzle into the cold mold. As soon as the plastic cools to a solid state the mold opens and the finished plastic piece is ejected from the press.

The problem with injection molding of thermosetting materials is that, under heat, these plastics will first soften, then harden to an infusible state. Thus it is essential that no softened thermosetting material in the heating chamber be allowed to remain there long enough to set.

Jet molding, offset molding and molding using a screw-type machine overcome this problem by liquefying the thermosetting plastic material just as it goes through the injection nozzle into the mold, but not before.



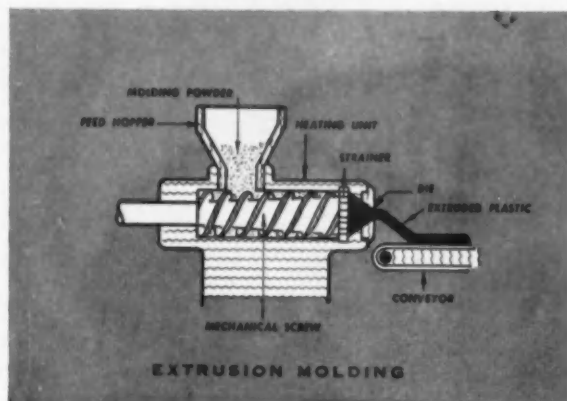
Blow molding is a method of forming used with thermoplastic materials.

Basically, blow molding consists of stretching and then hardening a plastic against a mold. There are two general methods of doing this type of thermoplastic molding: the direct method and the indirect method, encompassing several variations of each.

In the direct method a gob of molten thermoplastic material is formed into the rough shape of the desired finished product. This shape is then inserted in a female mold and air blown into the plastic, as into a balloon, to force it against the sides of the mold. The formed material is then cooled before removal from the mold.

In the indirect method a thermoplastic sheet or special shape is first heated, then clamped between a die and cover. Air pressure forced between the plastic and the cover forces the material into contact with the die which has the contour desired in the finished product. The plastic is cooled before removal from contact with the die.

## PROCESSING



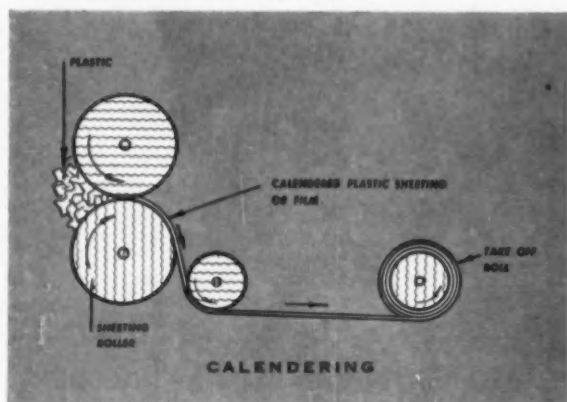
Extrusion molding is the method employed to form thermoplastic materials into continuous sheeting, film, tubes, rods, profile shapes, filaments, and to coat wire, cable and cord. Film includes thicknesses of plastic material up to and including 10 mils; sheeting refers to thicknesses over 10 mils.

In extrusion, dry plastic material is first loaded into a hopper, then fed into a long heating chamber through which it is moved by the action of a continuously revolving screw. At the end of the heating chamber the molten plastic is forced out through a small opening or die with the shape desired in the finished product. As the plastic extrusion comes from the die it is fed onto a conveyor belt where it is cooled, most frequently by blowers or by immersion in water.

In the case of wire and cable coating, the thermoplastic is extruded around a continuing length of wire or cable which, like the plastic, passes through the extruder die. The coated wire is wound on drums after cooling.

In producing wide film or sheeting, the plastic is extruded in the form of a tube. This tube may be split as it comes from the die and then stretched and thinned to the dimensions desired in the finished film.

In a different process, the extruded tubing is inflated as it comes from the die, the degree of inflation of the tubing regulating the thickness of the final film.



Calendering can be used to process thermoplastics into film and sheeting and to apply a plastic coating to textiles or other supporting materials. Film refers to thicknesses up to and including 10 mils while sheeting includes thicknesses over 10 mils.

In calendering film and sheeting, the plastic compound is passed between a series of three or four large, heated, revolving rollers which squeeze the material between them into a sheet or film. The thickness of the finished material is controlled by the space between the rolls. The surface of the plastic film or sheeting may be smooth or matted depending on the surfacing on the rollers.

In applying a plastic coating to a fabric or other material by the calendering process, the coating compound is passed through two top horizontal rollers on a calender while the uncoated material is passed through two bottom rollers, emerging as a smooth film which is anchored to the fabric when fabric and film pass between the same rolls.

adhesive and equipment producers. This group is concerned with the lamination of specially calendered vinyl sheetings to steel, aluminum and other metals.

Representative companies of the VMLI have worked closely with automakers since 1955. Headway was made with the introduction of the first vinyl metal laminates on the 1956 Cadillac and Pontiac. In 1957, Ford used the laminate on the Thunderbird. Today, almost all of the interior metals parts of the "T-Bird" are vinyl metal laminates.

Other 1961 automotive applications include the interior of the tail gate on both the Ford and Mercury station wagons.

Continuous cooperation with the automotive industry in developing improved products and more effective uses is expected to increase the demand for these laminates and spur the activity of the Vinyl Metal Laminators Institute.

### PLASTICS FOR TOOLING DIVISION

*Fred Lyijynen, Chairman*

SERIOUS work in this field was undertaken some six years ago by both the automotive and aircraft industries to set up standards and specifications for plastic tooling. Within the past two years, a great deal of constructive work in this area has been accomplished.

Working with both ASTE and Purdue University, standards and test procedures for basic materials were set up. Test results may now be purchased from ASTE. Pamphlets on casting and laminating methods are also available from SPI for Tooling.

At the present time, the Detroit Chapter of SPI is writing Standards for Plastic Tooling relating to gages, spotting racks, die model duplications and checking fixtures.

### FLUOROCARBONS DIVISION

*Edgar S. Peierls, Chairman*

THE use of fluorocarbon plastics by the automotive industry is just beginning. The fields of application are numerous and with each new usage the exciting potentials that these materials promise continue to expand.

The reason for this is that the engineers who make up the automotive industry are extremely quality conscious, along with having a firm knowledge that cost is of primary importance. Yet these materials are challenging because of their unique properties. In some respects for the first time since the Automotive age began, there are new materials

## PROCESSING

that offer the possibility of replacing metals that have withstood the test of the formative years, and more important still these materials offer the promise of doing the same job better, or to make the difficult application possible.

The fluorocarbon industry which is composed of fabricators, molders, and coaters of fabric and metal is in itself a relatively new industry, but has been successful, along with the more economical production of the raw material, to match such cost reductions by techniques of fabrication that have permitted the economical use of these materials in the automotive industry. As an example, one of the best known characteristics of the fluorocarbon materials is its excellent resistance to both heat and high friction.

There are many applications in the automotive industry which call for material which would be outstanding in performance under such adverse conditions, but the actual ability to design or create the shape of the material that is both usable and can be economically produced represent a challenge that the fluorocarbon industry working with the automotive industry has been able to meet.

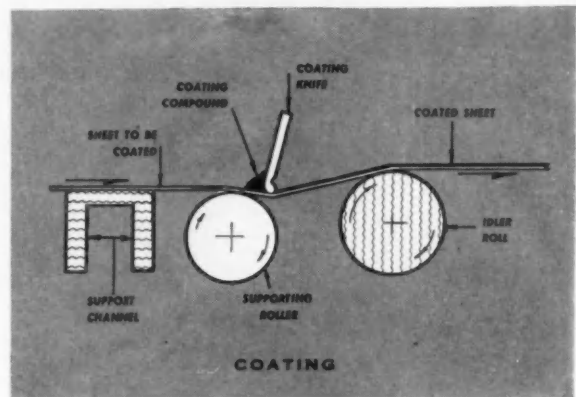
Just a few of the existing applications that have been successfully applied to the automotive industry are seal rings that out-perform metal rings by the elimination of the split, and thereby improve the sealing characteristics; bearing surfaces that will operate satisfactorily without lubrication, or with limited lubrication; lubricants that will improve the surface life of automotive parts; seals and bearings that must operate in difficult environments such as high temperatures; bearings in the presence of gasoline, and as a medium of reducing friction on flexible cables. In the area of development and evaluation the fluorocarbon materials are being tried where high impacts exist, such as on joints that are difficult to lubricate. In the engine proper where temperatures and compressive loads are known to be high, but not necessarily beyond the scope of these materials, testing is progressing with encouraging results.

Although the fluorocarbon industry is young, it has demonstrated an unusual vigor and willingness to develop these plastics for these uncommon applications and services.

Perhaps foremost in this development has been the research into improving the resins by compounding with fillers and additives that should not only supplement the unique properties of the resins, but would assure the designer and the engineer and the ultimate user of improved reliability.

The cooperative effort will continue for the advancement of both the automotive and fluorocarbon industries. ■

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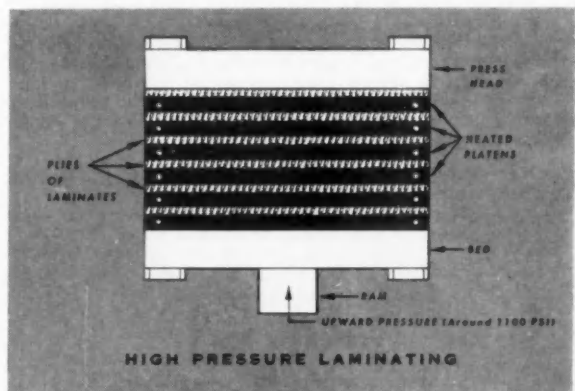
Thermosetting and thermoplastic materials may both be used as a coating. The materials to be coated may be metal, wood, paper, fabric, leather, glass, concrete, ceramics or other plastics.

Methods of coating are varied and include knife or spread coating, spraying, roller coating, dipping and brushing. Calendaring of a film to a supporting material, described under calendaring, is also a form of coating. A new method for applying plastics to metals is called the fluidized bed process.

In spread coating, the material to be coated passes over a roller and under a long blade or knife. The plastic coating compound is placed on the material just in front of the knife and is spread out over the material. The thickness of the coating is regulated by the speed at which the material is drawn under the knife and the position of the knife.

In roller coating, two horizontal rollers are used. One roller picks up the plastic coating solution on its surface and deposits it on the second roller which in turn, deposits the coating solution on the supporting material.

A plastic coating may also be applied by spraying it through a spray gun or by brushing it over the material to be coated as in silk screen work. Articles to be coated may also be dipped into a solution of plastics until the desired thickness of coating is achieved, and then dried.



Thermosetting plastics are most generally used in high-pressure laminating which is distinguished by the use of high heat and pressure. These plastics are used to hold together the reinforcing materials that comprise the body of the finished product. The reinforcing materials may be cloth, paper, wood, fibers of glass.

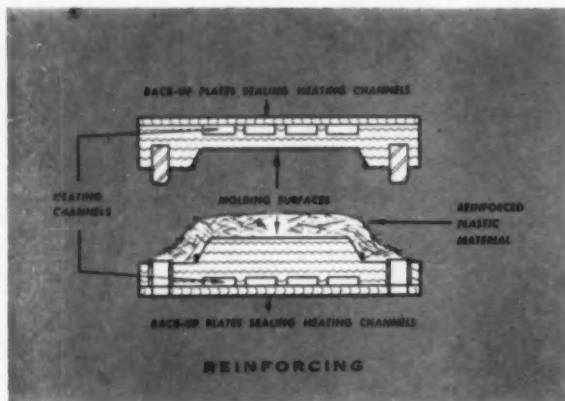
The end product of high-pressure laminating may be plain flat sheets, decorative sheets as in counter tops, rods, tubes or formed shapes.

Whatever the final shape, the first step in high-pressure laminating is the impregnating of the reinforcing materials with plastics.

In producing a flat surface, impregnated sheets are stacked between two highly polished steel plates and subjected to heat and high pressure in an hydraulic press which cures the plastic and presses the plies of material into a single piece of the desired thickness.



## PROCESSING



Reinforced plastics mostly employ thermoset plastics though some thermoplastics are used.

Reinforced plastics differ from high-pressure laminates in that very low or no pressure is used in the processing. The two methods are alike in that in both the plastic is used to bind together the cloth, paper or glass fibers reinforcing material used for the body of the product. The reinforcing materials may be in sheet or mat form and their selection depends on the qualities desired in the end product.

Reinforced plastics offer exceptionally high strength with low weight. Also, they lend themselves to easy, economical fabrication, requiring relatively little pressure and heat for curing and employing types of molds and other equipment that represent a fraction of the investment cost for metal fabricating dies and machinery. Thus, they make possible considerably larger plastics products.

A number of different techniques may be employed in the production of reinforced plastics. In making formed shapes, impregnated reinforcing material is cut in accordance with the shape of the finished product into one piece or a number of pieces. The pattern or patterns are placed on a male mold in enough volume to give the final thickness and form. Molding is completed in heated mated dies. A single mold may be used. The impregnated reinforcing material may be laid up on a male mold, inserted in a rubber bag from which all air is withdrawn so the bag presses around the layup, and cured in an oven. If a female mold is used, a diaphragm is placed over the end of the mold so that when air is withdrawn from within the mold the diaphragm is drawn down inside the mold to press against the layup of resin impregnated materials.

In producing a continuous laminate, a web of reinforcing material passes through a bath of plastic resin, between rolls or under wiper bars that remove excess resin and then between sheets of cellophane or coated paper. Thus protected, top and bottom, the material goes through the curing oven. After curing the cellophane or paper is stripped off.

## FABRICATING

Fabricating covers operations on sheet, rod, tube, sheeting, film and special shapes to make them into finished products. The materials may be thermosetting or thermoplastic.

Fabricating divides into three broad categories—machining; cutting, sewing and sealing of film and sheeting; and forming.

### Machining:

Machining is used on rigid sheets, rods, tubes and special shapes. The various operations include grinding, turning on a lathe, sawing, reaming, milling, routing, drilling, tapping.

### Cutting, sewing, sealing of film and sheeting:

In this category of fabricating fall all the operations involved in fashioning plastic film and sheeting into finished articles like inflatable toys, garment bags, aprons, raincoats, luggage.

For all these articles the film or sheeting must first be cut to pattern. This cutting may be done in a press by a

power-driven hand-operated knife or by other methods.

It remains to join the various pieces of film. This may be done by sewing or heat sealing. Cements are rarely used in fabricating film.

### Forming:

In working with flexible thermoplastic sheets, the first step is usually the cutting or blanking out of sections roughly approximating the dimensions of the finished article. This blank may be beaded for added strength, creased and folded into final form—a box, for example. Or deep drawing may be employed, using male and female molds to shape the plastic blank.

Rigid sheet may also be molded to final form. There are a number of methods of thus shaping a sheet. In vacuum forming or molding, the heated sheet is clamped to the top of a female mold and either drawn down into the mold by vacuum or forced down by air pressure. In snapback forming the heated sheet is drawn into a vacuum pot and a male mold lowered inside the bubble formed by the sheet. As the vacuum is released the hot sheet snaps back against the male mold.

## CASTING

Casting may be employed for both thermoplastic and thermosetting materials in making special shapes, rigid sheets, film and sheeting, rods and tubes.

The essential difference between casting and molding is that no pressure is used in casting as it is in molding.

In casting, the plastic material is heated to a fluid mass, poured into either open or closed molds, cured at varying temperatures depending on the plastic used, and removed from the molds.

Casting of film (and some sheeting) is done on a wheel or belt, or by precipitation in a chemical bath.

In the case of wheel or belt casting, the plastic is spread to the desired thickness on the wheel or belt as it revolves or moves and as the temperature is increased. The film is then dried and stripped off.

## SOLVENT MOLDING

Thermoplastic materials are used in this process of forming.

Solvent molding is based on the fact that when a mold is immersed in a solution and withdrawn or when it is filled with a liquid plastic and then emptied, a layer of plastic film adheres to the sides of the mold.

Some articles thus formed, like a bathing cap or vial, are removed from the molds. Other solvent moldings remain permanently on the form as, for example, a plastic coating on a metal tube.

## PULP MOLDING

Thermosetting plastics are used in pulp molding.

In this process a porous form, approximating the shape of a finished article, is lowered into a tank containing a mixture of pulp, plastic resins and water. The water is drawn off through the porous form by a vacuum. This causes the pulp and resin mixture to be drawn to the form and adhere to it. When a sufficient thickness of pulp has been drawn onto the form, it is removed and then molded into final shape.

## FINISHING

The finishing of plastics includes the different methods of adding either decorative or functional surface effects to a plastic product.

Film, sheeting and coated materials:

These forms of plastics may have the texture of their surface changed, either during processing or after, by being pressed against a heated roller or mold that is embossed with a pattern.

Colorful patterns may also be printed on the surface of film, sheeting and coated material either by letter press, gravure or silk screening.

Rigid plastics:

There are a wide variety of methods of adding decorative effects to the surface of rigid plastic parts. One is metal plating, accomplished through metal spraying, vacuum deposition or metal dusting and painting.

Other means of decorating involve stamping the finished product, printing by silk-screen or offset, engraving, etching or air blasting.



# Rubber Tires

Find Wide

## Application

in

## Construction Equipment

By Kenneth Rose

MID-WEST EDITOR



Lifting a loaded shovel 12 ft before dumping

**F**OR almost 30 years, rubber tires have shown their practicality for farm tractors. So well established has the rubber-tired wheel tractor become in agricultural work that today only a few crawler tractors find service on the big corporation farms, and these are often used for such special service as land contouring, irrigation work, and similar earthmoving applications.

Rubber tires have also found application in construction equipment. Tractors in this service, however, have tended to remain crawler-type machines, partly because of their superior tractive effort. Meanwhile, the rapidly developing industrial truck field made use of rubber-tired wheels almost 100 per cent, because much of their work lay in warehouses, freight depots, and manufacturing plants. Even for such outdoor work as handling of coal, sand, gravel, and other bulk commodities, rubber tired shovels held first place.

About 12 years ago, one of the major materials handling equipment producers, Frank G. Hough

Co., began to design its tractor shovel for use in earthmoving—as a digging machine rather than for scooping up and transporting loose materials. The rubber-tired shovel found favor with contractors; and other companies, manufacturing

both handling and construction equipment, began to produce similar machines. As more powerful, faster, higher capacity wheeled tractor shovels came into the market, they found wider acceptance in earthmoving. (Cont'd)



The wheel tractor shovel has great digging power



*There is ample clearance for discharging into a truck*



*Cutting down to grade for a paving job*



Actually, the demand for wheel loaders started during 1958, when their sale increased more than 25 per cent in a year that saw sales of construction equipment generally depressed. Several companies now report that wheel loaders are their best-selling items of construction equipment.

The rubber-tired wheel loader has the advantage of higher speed and greater ease of handling over the crawler. The crawler can turn in its own length, is usually heavier, has greater tractive effort per pound of weight (about 0.85 lb of push or pull per lb of tractor weight for crawlers, 0.65 lb per lb of weight for wheeled tractors) and can work under conditions of grade or flotation impractical for wheeled tractors. The rubber-tired tractors can run over paved surfaces. Rubber tires are expensive, but abrasive dust can cause excessive wear on track mechanisms, too. Contractors will continue to find use for both types of tractors. Most manufacturers of tractors now offer both types to the construction field.

In addition to the wheel loader or tractor shovel, contractors have found increasing use for wheeled tractors as such. Wheeled tractors are now available in sizes larger than those of the crawlers for use as pushing or pulling machines, and as bulldozers.

The wheel loader is primarily a digging, transporting, and loading vehicle. It has the advantage of being able to load into trucks, whereas the motor scraper can load and transport only. The wheel loader can economically transport earth for short distances, perhaps a few hundred feet, but the truck is so much more economical for transporting, that for any considerable length of haul, the wheel loader will serve as a truck.

The wheel loader competes with the excavator only under special circumstances. The excavator, acting as shovel, dragline, or backhoe, can operate below its own level, and in wet or dry soil, loading into a transporting unit. It can operate

*This tractor shovel can load a 10-ton truck in 3½ minutes*

economically between different levels for digging and loading. The wheel loader has the advantage of greater mobility, is more easily transported between jobs, and can transport earth for a short distance in addition to digging.

On the construction job, the wheel loader, especially in the smaller sizes, is a utility tool as well as a digger and loader. Contractors find them useful for trimming in excavation, for hauling sand and gravel, for transporting concrete in small batches for patching, and for backfilling.

An unusual application that is developing is in the excavation of deep pits for missile launching stations. Here the tractor shovel, either wheel or crawler, digs its own pit, and when the excavation is completed is lifted from the hole by a crane.

In addition to earthmoving operations, the wheel loader is finding increasing use in moving bulk materials in quarries, chemical plants, brick and tile plants, sand and gravel pits, saw mills, and so on. Municipalities and highway departments are using it for snow removal. Utilities find it useful in handling coal and in removing ash.

The Hough Co., a subsidiary of International Harvester Co., has five models, ranging in bucket capacity from  $\frac{3}{4}$  to 8 cu yd, and with speeds of 21.3 to 26 mph maximum. These are all four-wheel drive machines.

Clark Equipment Co.'s Construction Machinery Division offers a line of nine models of tractor shovels, ranging in capacity from 16 cu ft to 6 cu yd. Top speeds range from 11 to 28 mph. Long one of the leaders in materials handling equipment, Clark was one of the early construction equipment manufacturers to offer wheeled tractor shovels in the new field of earthmoving.

Allis-Chalmers Mfg. Co. offers, through its Tractomotive Division, five models of tractor loaders, ranging in bucket capacity from 1 to 5 cu yd, and in top speed from about 27 to 30 mph. Pettibone & Mulliken Corp., another leader in the industrial truck field, has seven wheel loaders in its earthmoving line, ranging in bucket capacity



*Beginning excavation at a building site*



*Tractor shovel loads blasted rock from a four-mile long conduit trench at a power project*

from  $1\frac{1}{4}$  to 4 cu yd, and with a top speed of about 24 mph.

Caterpillar Tractor Co. has announced three models of wheel loaders in its Traxcavator line, with bucket capacities ranging from  $1\frac{1}{4}$  cu yd to  $2\frac{3}{4}$  cu yd, and with top speeds of about 24 mph. Several other manufacturers also offer wheel loaders, for which speed and capacity figures are not available.

As with most earthmoving equipment, a choice of bucket sizes is usually available for each unit, so that it can be used with maximum efficiency in materials of different densities. ■

## Ford Fellowships

Henry Ford II, president of the Ford Motor Co. Fund, has announced a unique Ford international fellowship program under which outstanding scholars from all areas of the free world will come to the U. S. this year for graduate study at leading educational institutions.

The program will bring about 50 scholars to the U. S. for a year of study in their chosen fields. The Ford Motor Co. Funds has made a grant of \$250,000 to the Institute of International Education.

# INDUSTRIAL DESIGN

## A STUDY OF ITS APPLICATION TO THE NEW JOHN DEERE TRACTORS

**D**EERE AND COMPANY was the first large manufacturer of farm machinery to retain a firm of industrial design consultants. We have worked closely with Deere since 1937, and have spent these 23 years improving our knowledge of production methods, and market requirements in this field, by integrating ourselves with the company, yet at the same time, keeping sufficiently apart so as to be able to give our client that very important ingredient, "the outsider's point of view."

Six years ago the decision was made to produce a completely new line of John Deere tractors. Here was a challenge which far exceeded in scope anything which had ever been attempted in this field before. To be specific, nineteen tractor models, and a host of allied equipment have been designed and put into production since that historic decision was made.

Our role as industrial designers in this team approach was, we believe, successful because of the following basic procedures:

- We were completely integrated with the company's engineering and marketing groups.
- Being outside consultants with a considerable background of success in fields other than agricultural machinery, we brought an authority to the job which helped speed up the process of design decision considerably.
- The company brought us into action at the very beginning. As in all well designed products, some of the first basic ideas relating the man to the machine are all important, and if parameters relating to the user (of "JOE" as we call him) are not laid down before the transmission and engine have been worked out, there is not much hope for JOE!
- Good liaison between our office in Pasadena, California and the John Deere Waterloo Tractor Works in Iowa, was maintained through numerous trips, both by our designers to Waterloo, and the Deere engineers to California. The mail and telephone filled in the gaps.
- As in all work we do for Deere, as well as for other clients, our role was not cut off as soon as designs were on paper. Design changes are inevitable, and we were keyed in on any changes affecting the final appearance and convenience of the tractors. These changes were legion, but very few indeed could be said to have downgraded the machines from these points of view; in fact, production limitations more often stimulated engineers and designers alike to better and simpler solutions.

- During the critical period of pattern production and sample part runs from sheet metal dies, we were an integral part of the inspection teams. In some ways this was one of the more important phases of our work, as engineering drawings can never quite interpret design concepts of molded forms. These forms were new to our client, since all previous tractor designs had been fairly geometrical in form and easy to interpret. No involved lofting drawings had ever been needed before.

What must have been one of the first basic design discussions of this program was held in the rather austere Board Room at the Deere and Company offices in Moline. About twenty-five people were present including the President, the Vice-Presidents of Marketing, Product Development & Tractor Production, Chief Engineers of the tractor plants, ourselves, and a number of project engineers and product research men. It was an impressive group to say the least, and in retrospect, some of the decisions which were made proved to be pretty sound.

At this meeting Henry Dreyfuss put in an urgent plea that a place be found for mounting the gas tank, so that when the larger LP tanks were substituted, they would not protrude through the sheet metal hood. He pointed out that the LP tank problem on the present production models, our own as well as those of competitors, could never be solved by an industrial designer; it required an obstetrician! It was decided that we should try placing the tank in front of the radiator.

There was also considerable discussion at this meeting as to how radical a design change should be made from the present line. After the very radical gas tank decision had been made, the President, the late Charles Wiman, dryly remarked that perhaps the only continuity of design needed was green and yellow paint!—probably the most potent suggestion of the meeting.

Some idea of the extent of the human effort required to put the new line of tractors into production can be visualized from the fact that the Deere engineers made 110,000 drawings. This is more than a top-notch draftsman, working eight hours a day, seven days a week, could complete in a lifetime if he was required to make them all himself. The drawings, if stacked one on top of the other, would make a pile more than 44 feet high!

The industrial design story of the tractor line was but a small part of this tremendous effort, but it was important not only because through appearance, the



# A VITAL INGREDIENT

BY WILLIAM F. H. PURCELL, A.S.I.D. PARTNER OF HENRY DREYFUSS

integrity and quality of the engineering was expressed, but also because it helped the ultimate user, the farmer, to gain greater total satisfaction from his investment. We have a motto in our office which describes what is meant by "greater satisfaction." It reads:

"We bear in mind that the object being worked on is going to be ridden in, sat upon, looked at, talked into, activated, operated, or in some other way used by people individually or en masse. When the point

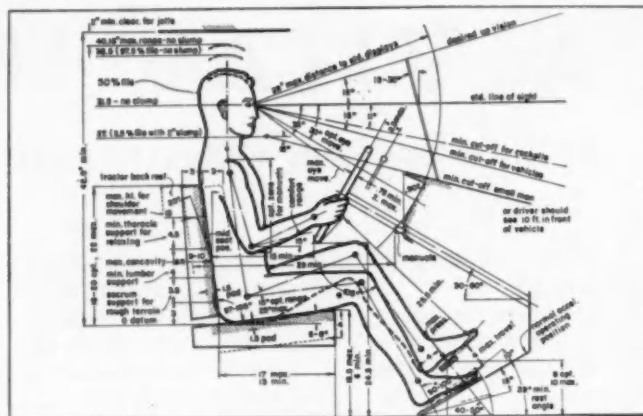
of contact between the product and the people becomes a point of friction, then the industrial designer has failed. On the other hand, if people are made safer, more comfortable, more eager to purchase, more efficient—or just plain happier—by contact with the product, then the designer has succeeded."

Perhaps the remainder of this story can be told better through the captions and illustrations which follow: ■

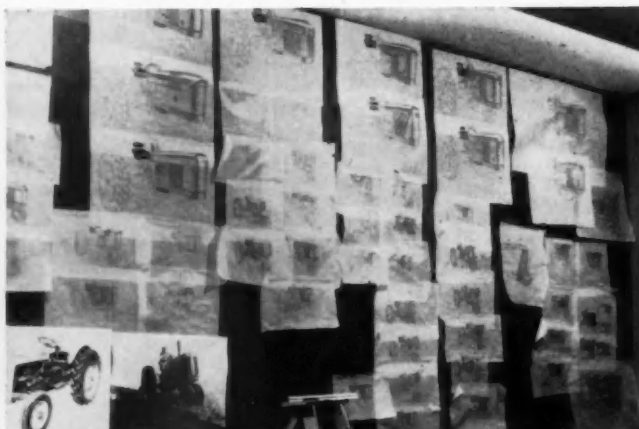
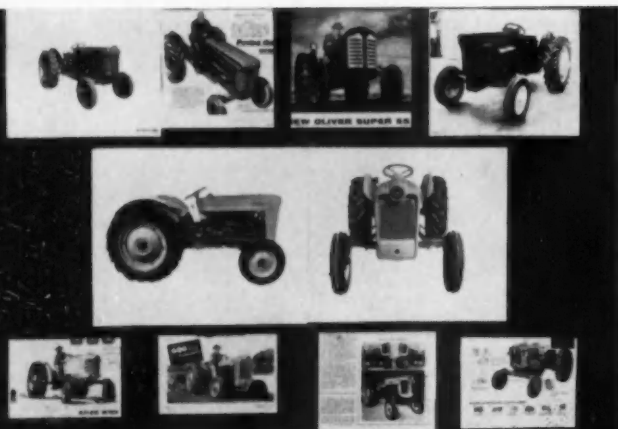
■ The final production tractor. Strength, pulling power, and quality are expressed by the design of this 80 HP diesel model. "JOE" has been consistently cared for, he can mount and dismount with ease, stand or sit with safety and comfort, and has good visibility. The mechanical design has been thoroughly tested over a period of five years. These are ingredients for successful sales.



**1** This is "JOE," the average man. Dimensions cover 95 percentile of the U. S. males. The chart\* is one of many used by our office to determine correct distances from seat to steering wheel or control levers, as well as the thickness of handles to avoid fatigue and the best distance of instruments from the eye for accurate readings. "JOE" provides the basic dimensions for any product design in our office.



\*Chart from *THE MEASURE OF MAN* by Henry Dreyfuss, published by Whitney Library of Design, New York.



**2** COMPETITION provides a starting place for appearance factors in a new design. Study of all existing tractors as well as related vehicles such as trucks and automobiles was made. Photographs were mounted on 4' x 4' boards and kept handy during all design reviews. The sixty-four dollar question was "What will farmers expect in six to ten years time?" What will influence their tastes in this period?

**4** Early quarter-size clay models are very crude and done fast. They are really rough sketches done in three dimensions. Models are kept for comparative study if good, otherwise recorded by photographs and the wood buck cleaned off for the next round.

The wood buck has all the basic engine and transmission components in place, so that the clay, representing the packaged vehicle, is certain to indicate sufficient volume and clearance for the working parts.



**3** PIN UPS! Cork walls in Henry Dreyfuss' office are loaded with preliminary sketches to try to determine some basic design approaches. These roughs are weeded out pretty fast and promising designs are carried a step further into rough clay models.

**5** "DRIVER-COMFORT" was high on the list of design criteria. It called for a seat which was medically sound, and which would reduce driver fatigue to a minimum. A design team of Deere engineers, our office, and a leading medical authority, Dr. Janet Travell of Cornell Medical College in New York (whom we have retained as consultant on seating for many years on diverse projects), carried this program along for more than a year, concurrently with the preliminary tractor design work. Seat mock-ups such as illustrated here, were followed by field trials to test Dr. Travell's theories.



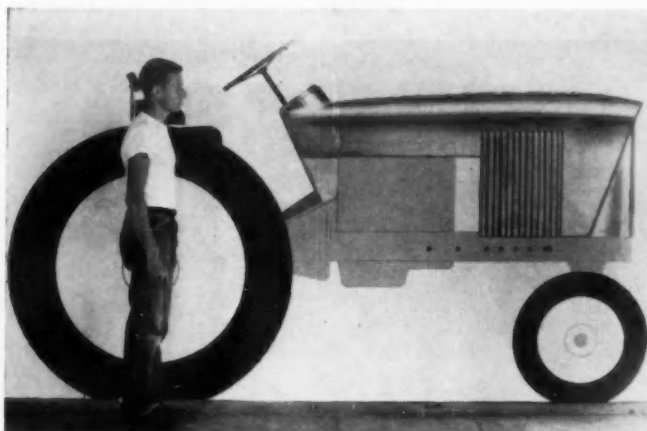
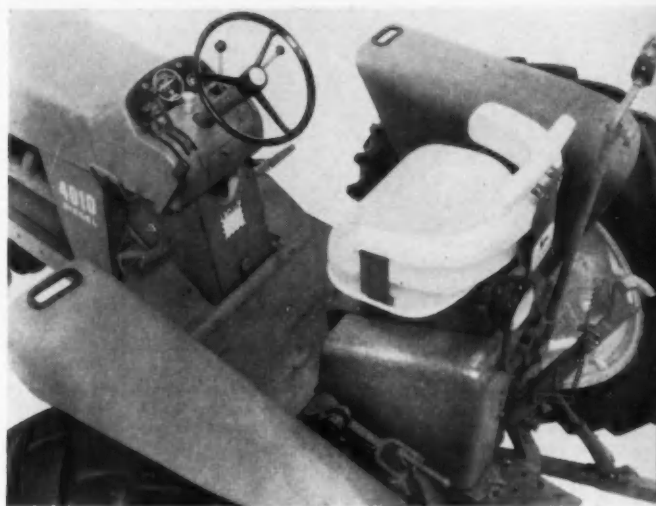
**6** The final seat design incorporates the following basic features:  
The seat adjusts to the physical proportions of the driver. Resting on an inclined track, the seat slides up and back for taller drivers, forward and down for shorter drivers.

A quick-release lever jumps the seat backward when the driver stands at the wheel or dismounts. When he sits down again, a built-in "memory" device returns the seat to the same pre-selected position on the track.

The seat consists of three separate cushions: a seat cushion; one for the lower back (or lumbar region) that fuses with cushioned arm-rests; and an upper back cushion. This unique three-part design supports the natural S-curve of the spine. Particularly vital, the lower back cushion minimizes familiar "low back pain." The upper back cushion unit is spring-mounted to give support to the back on smooth terrain when the driver can lean back. On rough ground he sits up straighter and can avoid any pounding effect caused by the high seat back.

The cushioning itself is "variable density foam": firm in some areas, soft in others. This is particularly important in the seat-cushion, which is firm in the center (where the body's weight rests on the bony points of the pelvis), but soft at the forward edge, to minimize pressure on the large blood vessels in the thighs.

The seat suspension is "rubber in torsion" and has about four inches of vertical "travel" to soak up road shock. A knob permits the driver to adjust the suspension to suit his weight.



**7** Full size air brush renderings are made to check proportions and hood shapes. The fuel tank is placed above the front wheel and ahead of the radiator core. Air enters the radiator through corrugated sheets of finely perforated steel on either side of the tractor. The tank is protected by a heavy front plate which supports the hood, tank, and side sheet metal panels.

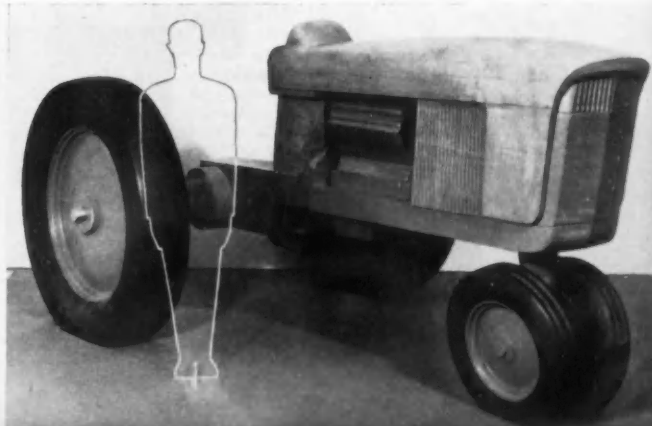


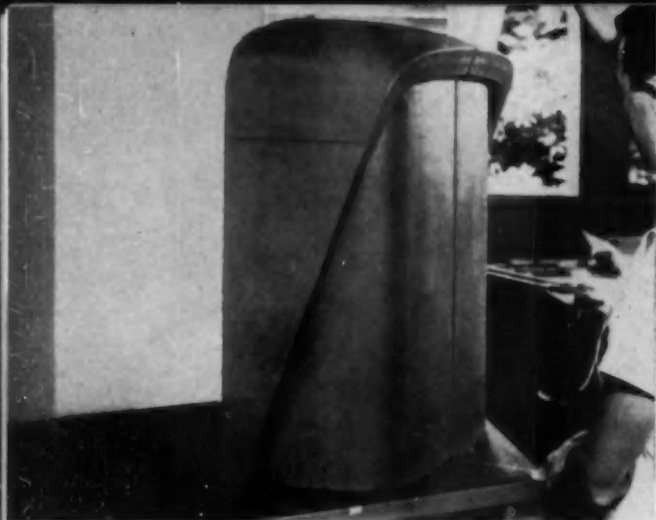
**8** A quarter size clay model of the 45 HP tractor used for the first presentation to Deere management. It should be noted that in spite of the numerous designs developed, only one was selected and presented to the client.

**9** An early quarter scale clay model of the 80 HP machine. These small models are photographed with a dubbed in scale figure. They give a more realistic effect of scale than the models themselves. This model shows how the ease of access to the drivers seat has been attained. There is plenty of room between the hood and wheel for our friend JOE.



**10** The general design approach having been sold to the "high council," the inevitable modifications were made. The front of the tractor was sloped forward to reduce the apparent overhang of the frame beyond the front wheels, and also gave the effect that the machine was pulling, a generally more dynamic design. An additional air intake was added in the front plate for proper cooling and also served to reduce the severity of the solid front.





**11** Full size clay models were made of critical design areas. This shot shows a cost saving device. Only a half model is made to the center line of the tractor. A mirror held on the center line gives the effect of the full model.



**12** Work starts on the full size clay models of the 55 HP tractor. The wood buck to receive the modeling clay is securely mounted on a flat reference table from which all dimensions are taken. Before the clay is applied, a set of full size lofting drawings are constructed. From these, sections are taken about five inches apart, along the hood center line, and these are used to cut templates for very accurate clay work.



**13** Rough clay is applied hot to the wood buck so that no air pockets occur. Nothing is more aggravating than trying to "tool" clay down to a fine finished surface when you keep uncovering little hollows!



**14** The clay model is close to completion. Side panels and frame front casting are in place. Note that the front tractor wheels are kept in place to give the model scale. Also important, is the fact that the hood model is worked on at the height it will actually be on the finished tractor. This gives the Industrial Designer a correct perspective at all times.

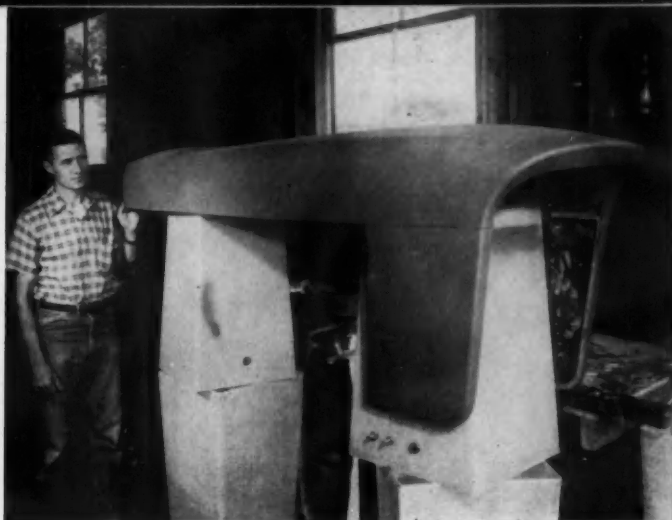
**15** The completed clay model with air intake grill screens and an early version of a name strip in place. The hood has a small chrome die casting on top. This feature was added after field tests showed that drivers needed a "front sight" to steer by.







**16** Fiberglass molds were taken off the clay hood and side panels. Hand lay-ups are shown being made from the female mold. Several sets of these parts were shipped from our Pasadena office to the engineering center for use on full size mock-ups and working prototypes.



**17** The finished fiberglass parts ready for shipment. One of the most important advances in tractor design is the fact that the hood is made in one piece. This imparts a quality to the finished Deere product that no other company has equalled. The die costs are high but there are fewer parts to handle and assemble.



**18** A full size mock-up of an almost final design made by the John Deere model shop. This model points up two more basic design goals which were agreed upon in early design discussions. The first, that all necessary joints in the sheet metal should be a part of the design, and never appear arbitrarily in the middle of an important form, such as the hood, cutting it up visually and destroying its integrity. Joints can help a design if they are treated with respect in this manner. The second goal was to develop a curved hood form, which when seen from the side would reduce the effect of the hood sloping uphill or downhill when different size tires are used. The old style hood with a straight top seemed to exaggerate this effect, especially on the larger models.



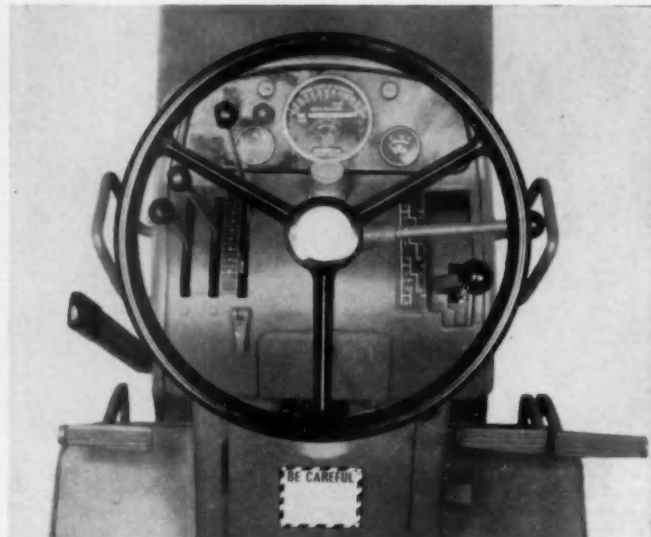
**19** Much attention was given by John Deere engineers and our office to cleaning up the back of the tractor. Necessarily complicated, by hitches and adjustment points, these details were carefully designed to give the machine a consistent quality of good design. In the same manner, the engine, being exposed to view, was given special attention.



**20** A design for a new steering wheel being tried out for "feel." After this a prototype wheel was made and given actual field tests. Spokes and hub are kept as small as possible to reduce visual interference with instrument panel.



**21** An early full size study of the instrument panel. Legibility of dials and numbers was given a high priority in the treatment of the panels. Simplicity is the keynote.



**22** The final instrument panel and control area as seen by an operator's eye. Note the careful placing of the instruments to obtain maximum visibility. The hydraulic controls are on the left side of the steering column, each knob being given a different "feel," by molding flats on the basic sphere. The gear shift lever is to the right, and the shift pattern is clearly marked by Mylar decals.

**23** One of the final design studies made was to determine correct sizes of lettering for decals and model numbers. Designs were set up in color and photographed from various distances. The readability of a name or number is of great concern to the Advertising Department, since a lot of good free advertising value is to be had from any photograph of a well labeled product which is published in a magazine or newspaper. There are many rules given for determining the dimensions of readable letters at various distances, but there is only this one way to be sure!



**24** In addition to the domestic John Deere line, a new line of agricultural tractors was designed for the John Deere-Lanz factory in Mannheim, Germany.

This picture of the 28 HP model, shows the family resemblance to the domestic line. The principle difference being in the fenders, which are slightly curved, and may be used as a seat for a passenger, a legal requirement in Germany.

Another design difference is in the use of perforated metal side panels closing in the engine. This is a market preference, probably stemming from the fact that in the rural districts farmers use their tractors as a general means of transportation, and prefer them to look more finished.



**25** The Model 8010 is the "Granddad" of the new line. A giant ten-ton farm tractor which powers the largest pieces of integral farm equipment ever produced. Design emphasis was

put on ruggedness and power. Good human engineering was given priority.



**26** A full line of industrial tractors and related equipment was designed concurrently with the farm units. Here the design expresses their function and strength through absolute simplicity of form. Heavy gauge metal is used for the hood and front section which eliminates need for special rock guards when used as a loader. It also calls for use of straight lines and break bends as opposed to the compound forms used in the thinner sheet metal hood of the agricultural units. The simplicity of the loader design relates it visually to the tractor it mounts on.



**27** These are but a few of the nineteen new models of John Deere farm and industrial tractors put on the market in the last year. The agricultural units shown here illustrate the family appearance which ties each line together.

The late President's remark, that it might only be necessary to carry over the yellow and green paint from the old design to the new, was taken quite literally!

Such courage deserves success.

# A METHOD FOR PROJECT Management

By L. R. Parkinson

**D**URING the several years in which I was engaged as a consultant in engineering management, I had the opportunity to study many companies with diverse R&D activities. In many cases the presidents have not grown up with the company, but have been brought in because they were successful in other companies and not infrequently they had been in an entirely different industry. Everyone can readily think of one or more examples.

Certainly it can be said that many of these men would be leaders in any activities they undertook, but this is to a large extent because there is a denominator common in the equation for success. The term "success" is used in the generally accepted business sense and has no philosophical connotation. If there can be a common factor in corporate management, can there be one in R&D activities? The answer to the question is in the affirmative and it again is management. Assuming that normal technical competence in the area of activity is available, the success of the endeavor will be determined primarily by the management of that talent. With this preface, I would like to discuss project management as the effective key to successful R&D activities.

In no case have I even had agreement in the beginning that what may have worked one place would work in another particular case. Engineers like to think that what they are doing is unique. No one else understands the particular vagaries of the work in which they are engaged. This is true. There may be considerable vagueness in their workings. It is precisely this that prompts the writing of this article, the purpose of which is to present a method for project management. It is important to note that this is a suggested method and, as a method, it can be adapted for any project because it is based on the premise that somebody is going to do something in a given time and with a given amount of money. Other conditions have not been tested.

It has been used with success in innumerable diverse

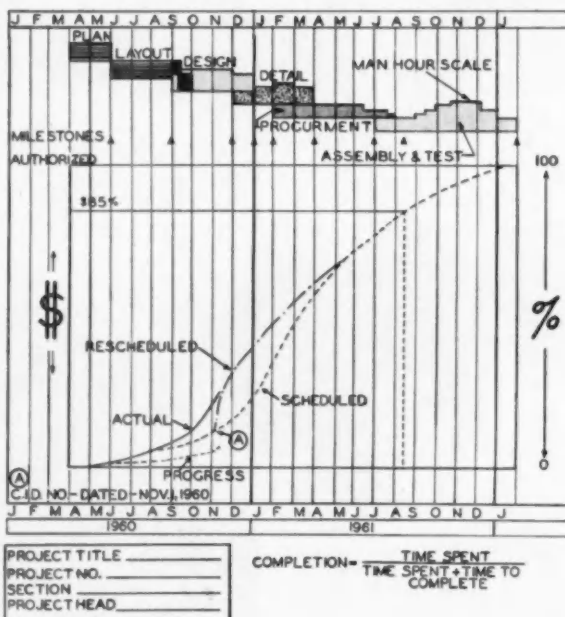
activities. In each case, the plan was modified to fit the clients' needs and for more universal application to the extent that it is impossible to determine true authorship. However, giving the client too much credit for solving his own problems is a poor practice and so no further comment will be made.

**S**UCCESSFUL project performance is the main effort of the Research Division and as a consequence, of all the skills which a supervisory engineer must master, none is more important than project management. While responsibility and authority for project management are delegated to section heads, project leaders and their line assistants, lines of control must be maintained by the Manager through the successive lines of management.

Project management requires a sequence of logical and basic steps which start with the preparation of a plan by the project head. The purposes of the plan are:

1. To delineate the objectives of the project and the steps to be taken to attain them
2. To secure approval of the general course of action planned for the project
3. To record specifications, authorize deviations from specifications, contractual terms and modifications, and other authorizations relative to the project
4. To serve as a desk reference of basic information on the project
5. To serve as an instrument for integrating the actions necessary to accomplish the project in order that each may be executed with maximum effectiveness.

The plan is expressed in terms of technical objective, dollars, time, manpower, and material. A project is divided into tasks which are natural and logical cate-





gories. Each task is planned by estimating time and cost, assigning responsibility, preparing schedules, collecting costs, and controlling activity in general. Important accomplishments and primary control elements within the tasks are identified as "milestones" and are the focal points of management attention. Each level of management may designate the specific milestones by which it will maintain contact with the project.

The plan is subject to the approval of the Director and the customer up through the group and section heads before work may be started. The degree of detail of the plan may be tempered by the size and complexity of the project. Upon approval of the plan and commencement of work, control is exercised through review of variance of actual performance from planned performance. Emphasis is placed on accomplishing the technical objective within the approved standards. Standards are kept current by periodic re-estimates of the project either as specified in the plan, or when variances become so large as to be unwieldy. The revised standard is subject to approval by the same authority which approved the original standard.

The prerogative of management to manage may be exercised at any time but this procedure automatically focuses attention at its three major decision phases:

1. The project plan
2. The evaluation of accomplishment
3. The determination of trouble and what to do about it

The last is the most elusive but also the decision is of the greatest importance.

## PROCEDURE

**U**PON assignment of a project to a section, a project head will be designated who will prepare the plan in accordance with the following procedure and who will be responsible for the project.

1. The project will be analyzed for technical and contractual requirements
2. Tasks will be delineated and responsibility assigned. Milestones will be established
3. Performance of the task will be given a sequence schedule
4. Manpower for each task and the project as a whole will be scheduled
5. Cost standards for each task will be scheduled
6. Inter-section work will be scheduled as a task
7. Charts and graphs will be prepared in accordance with the specified standards
8. Equipment and facilities required will be listed including company owned, rented, GFE, and that requiring a capital appropriation

After approval of the plan and work has commenced reports of project performance and status will be issued in terms of accomplishment, time, and cost. Reports will be prepared by and for the line organiza-

## TITLE

Project No. \_\_\_\_\_ Date \_\_\_\_\_  
 Task No. \_\_\_\_\_ Order No. \_\_\_\_\_  
 Person Responsible \_\_\_\_\_

## ESTIMATED ENGINEERING REQUIREMENTS

Week Ending						
Study						
Layout						
Detail						
Checking						
Mock-up						
Mach. Shop						
Elect. Shop						
Test						
Engineering						
Consulting						
Publications						
Laboratory						

tion. While the form will be uniform, the contents of each will be tailored to the needs of the supervisor for whom it is intended. The major part of performance and status will be reported orally at regularly scheduled meetings of the line supervision. The frequency of reporting to the Manager (and the customer) will be determined by the due dates of the tasks and milestones except that those tasks or milestones which have exceeded, or are expected to exceed their standards will be reported on at least weekly or at the discretion of the Manager.

The accompanying sample chart indicates a two-month planning period for a 22-month program. While adequate planning may be required for the successful completion of the program, the planning period shown may be a trifle optimistic from a practical aspect. Managements sometimes take the attitude that a project is best started by having someone start making drawings. All that can be said for this system is that the drawing serve as a reference for the change notices.

## PROJECT STANDARDS

**TASK** Each project will be subdivided into tasks; however, a small project may be a single task. A task will cover a discrete area of work within a project and will have a measurable accomplishment. In the selection of a task, consideration must be given to the following: Responsibility, scope of work, technical objective, time schedule and cost.

(Turn to page 144, please)

# GAS TURBINES

## *for Automotive Use*

**I**N the early years of this century, the pioneers of the aircraft industry naturally called upon the advice and experience of the automotive people for help with power plant problems. The automotive men were pioneering then too, but such information as they could offer on construction materials and engine design was gratefully and rapidly adopted by the new aircraft makers. For example, when Wilbur and Orville Wright wanted to put some push into the unpowered gliders they had been flying successfully for some time, they simply installed a conventional 12 hp gasoline engine in their 1903-model glider. This novel combination miraculously rose from the ground and stayed aloft for about 12 seconds on the morning of December 17, 1903. Later that same day another flight was made, traveling for 852 ft and lasting 59 seconds. These trips were hardly long enough for one to enjoy the de luxe dinner served aloft nowadays, but they were long enough to launch the Air Age and change the history of the world.

Nearly 60 years of continuous development have hurried by, and now help and information often travel in a reverse direction. Knowledge of materials and design gained from aircraft experience is today being applied to development of new automotive vehicles. Thus, high temperature nickel alloys first developed for use in jet engines are being regularly used for ground vehicles—in valve parts, for example. And engineers at the major

**By W. D. Mogerman**  
The INTERNATIONAL NICKEL COMPANY  
INC.

auto companies, having learned about the merits of turbines from their flying colleagues, are currently developing gas turbines for use on the road.

Automotive engineers are not the only ones who have had their eyes on the turboprop planes, turbine-powered helicopters, and jet planes—all the related newcomers that are giving piston engines such a run these days. During the last decade or so the stationary gas turbine industry has learned a lot from the new aircraft engines, and their products have won recognition as smooth, light, and economical prime drivers of alternators, compressors, pumps, and other industrial equipment. A rotating power machine, capable of burning almost any kind of liquid fuel efficiently and economically—with good torque characteristics and able to accelerate under heavy loads quickly and smoothly from a cold start—is bound to attract favorable attention. A considerable degree of success has been reported in the use of such stationary industrial gas turbines.

But when it comes to automotive applications for the gas turbine a somewhat different set of conditions has to be faced. The man who would supplant the piston engines, both spark and compres-

sion, that are traveling over the roads today, undertakes a formidable task indeed. Probably no other field of engineering has had so much concentrated effort and talent lavished on it throughout the entire world. Due to the heavy mass interest and unequalled demand, piston engines have achieved a very high degree of quality, and competitive improvement is still under way. The reciprocating engine, having served mankind well, has become so well established over the years that a rival kind of power plant will have to demonstrate some very clear points of superiority. To be seriously considered as a competitor for the reciprocating automotive engines in use today, a newcomer would have to prove itself to be lighter in weight and smaller in size for the same horsepower, able to deliver better performance, save on fuel, and remain economical to maintain. The remarkable fact is that after 10 years or more of careful testing, most or all of these merits are now being claimed for the automotive gas turbine, especially the new regenerative types with two shafts. Let us examine each of these points in the light of recent research.

### SIZE AND WEIGHT

**I**N the power ranges usual for passenger cars and trucks, on highway and off, turbines that are small in size and light in weight can be made. The greatest economy of a gas turbine is achieved at full load. But as an automotive engine runs much of the time at part-load, the competitive position of the gas turbine in automobiles is governed to a large degree by the availability of a suitable heat exchanger of high effectiveness. Rotary heat exchangers of small size, capable of high efficiency, 90 per cent or better, are now available.

A gas turbine usually has only about one-fifth as many parts as a comparable reciprocating engine. This indicates design simplicity,

a factor clearly related to smaller size and lighter weight. For example, the latest Chrysler regenerative automotive gas turbine is reported to weigh only 450 lb. Moreover, as an air cooled power plant, a gas turbine saves space in requiring no radiator or liquid cooling system. An early Chrysler turbine, installed in a standard production model Plymouth, demonstrated its practicality during a remarkable transcontinental run in March 1956. From New York to San Bernardino, California, no difficulty developed, and the engine was not turned off once. The overall fuel consumption ran between 13 and 14 mpg. A second Chrysler engine, in the 200-hp range, also installed in a standard Plymouth, proved far more successful on later runs.

During a 576 - mile highway cruise in December 1958, this second Chrysler model achieved an economy of 19.4 mpg, using fuel of various types. Chrysler is now carrying out development work on a third type of passenger car turbine engine. Engineers confidently predict the, "Once adopted to mass production methods it will come close to matching the passenger car reciprocating engine on equal terms in most respects and exceeding it in many."

## PERFORMANCE

**A** TURBINE-POWERED car gives a ride that is noticeably steady and free from vibration. The moving parts all rotate smoothly, without the changes of direction that

occur in a reciprocating engine, and combustion is necessarily continuous.

Another important advantage lies in the low temperature starting characteristics of the gas turbine. A General Motors 225-hp unit, the GMT-305 Whirlfire, has been installed in a heavy-duty ore hauling truck at Sudbury, Ontario, where the thermometer frequently goes far below zero. Test runs on this engine have shown that it can be started in about 30 seconds after extended cold soaking at -45 F. In fact, it can be readily started even at temperatures as low as -65 F, an obvious advantage in rugged climates. This cannot be done by a piston engine without use of special starting procedures. This significant gas turbine advantage will be discussed in some detail later in this article.

At one time, engineers looked upon high fuel consumption and slow acceleration as the two most serious drawbacks of the gas turbine for automotive use. But progress in correcting these two deficiencies has been rapid during recent years. Fuel consumption studies have been conducted by

the major auto makers for about a decade. The direction of additional progress depends on a number of factors, which vary when one thinks of heavy duty trucks or passenger cars. Fuel economy has been improved by means of carefully-designed new heat exchangers and other innovations.

According to a recent report by Chrysler turbine engineers:

"Fuel consumption has been reduced to equal that of piston engines, and there are no octane requirements. Properly developed, it will operate on almost any fuel that will flow through a pipe. The principal reason for the Chrysler gas turbine's modest appetite for fuel is the regenerator unit mounted atop the turbine, which recovers waste heat from the exhaust gas to preheat incoming fresh air on its way to the combustion chamber. Its effectiveness is in excess of 90 per cent. Not only does fuel go further, but exhaust gas temperature is below that of a conventional passenger car." (1)

Complete quantitative data on the rapid rate of improvement are not readily obtainable but significant evidence has been made public. The GMT-305 engine, which descended from a model having a fuel consumption rate of 1.63 lb/hp/hr is rated at 0.55 lb/hp/hr. As already mentioned, Chrysler engineers have reported a fuel consumption rate of 19.36 mpg during a run of 576 miles at 38 mph.

In Table I are presented some of the fuel consumption data published by three major American auto manufacturers for their gas

(Turn to page 118, please)

(1) "Gas Turbine Progress Report," ASME p. 79 (1958).

TABLE I  
GAS TURBINE BRAKE SPECIFIC FUEL CONSUMPTION  
(lb/hp/hr)

		1/4 power	1/2 power	Full power
Chrysler Corp.....	(1957)	0.65	0.54	0.48
Ford Motor Co.....	(1959)	0.58	0.48	0.56
General Motors Corp....	(1959)	0.84	0.67	0.55

TABLE II  
ESTIMATED OPERATING DATA ON COMPARABLE ENGINES

Manufacturer	Model	H.P.	Lbs/hp	SFC
Chrysler.....		140*	3.0*	0.48*
Ford.....	704	300	2.16	0.56
GM Allison.....	GMT 305	225	2.65	0.55
Diesel.....	various	20-500	6-10	0.42-.55
Gasoline engine....	Imperial (special)	225	4.7	0.61

\* Installed.

**A  
SHORT STORY  
ABOUT SPRINGS**

A BURTON coil spring



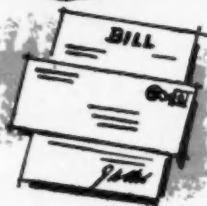
or a BURTON leaf spring



brings continued smiles  
from drivers




and fewer bills  
for maintenance



ask White, Mack, Diamond T, Dodge, Studebaker, Reo or Fruehauf

*...or ask us...we've been engineering top quality springs since 1923*

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# News of the MACHINERY INDUSTRIES

By Charles A. Weinert

**Latest NMTBA Statistics Show March Order Bookings on Machine Tools were at the Highest Monthly Level Since 1957, with Domestic Metal-Cutting-Machine Orders Leading the Rise**

## Machine Sales in March Rebound to High Level

After a moderately slow start in the first two months of 1961, sales of machine tools in March hit a relatively high level.

As a matter of fact, the overall volume of March bookings was the highest monthly figure for at least the past three years. The biggest rise was in domestic metal-cutting-machine orders.

Nevertheless, the 1st Quarter '61 order volume is about four per cent below that of last year's 1st Quarter—due to a slow February '61. On the other hand, 1st Quarter '61 still bettered the 2nd, 3rd, and 4th Quarters of 1960.

Net new orders for cutting-type machines amounted to a preliminary \$54.65 million in March. In this amount were \$40.35 million of net domestic orders and \$14.3 million of net foreign orders—after adjustments of about \$2 million apiece (foreign, and domestic) for order cancellations.

For comparison with March's \$54.65 million, cutting-type orders in February '61 have been finally valued at \$39.45 million net, and the 1960 monthly average is \$41.9 million.

When forwarding the March statistics, Ludlow King, executive vice-president of the National Machine Tool Builders' Assn., commented in part as follows:

"Net new orders of cutting-type machine tools totaled \$54.65 million in March, which was an increase of 39 per cent over February . . .

"Many builders who experienced sizable increases of new orders in March feel they were due to carry-over business that should have been placed in January and February. Some of the larger

orders came from the automotive industry and others from companies who are beginning to incorporate in their production lines the new technological advancements they witnessed at The Machine Tool Exposition-1960."

Forming-type machine net new orders in March totaled \$14.9 million preliminary, made up of \$10.7 million domestic and \$4.2 million foreign.

The \$14.9 million March figure compares with February 1961's \$6.95 million and the 1960 monthly forming-machine average of \$12.5 million.

For both types of machines combined, March net new orders amount to a preliminary \$69.55 million. The February figure was \$46.4 million. During 1960 the monthly average was \$54.4 million.

First Quarter '61 net new orders now stand at \$129.85 million in cutting-type machines and \$42.2 million in forming-type machines, for a total of \$172.05 million.

Again for comparison, 1st Quarter '60 combined net orders amounted to \$179 million, 2nd Quarter '60 net orders were \$156.9 million, 3rd Quarter '60 orders \$152.1 million, and 4th Quarter '60 orders \$165.15 million.

On shipments, cutting-type machines for March are valued at a preliminary \$41.95 million, while the February equivalent was \$35.6 million and the 1960 monthly average was \$42.3 million.

Forming-machine shipments in March are \$13.05 million preliminary, compared to February's \$10.05 million and the 1960 monthly average of \$12 million.

For both types of machines combined, March shipments amount to \$55 million preliminary, compared to February's \$45.65 million

and the 1960 monthly average of \$54.3 million.

First Quarter '61 combined shipments now tally \$146.15 million. In 1960, 1st Quarter shipments were \$162.85 million, 2nd Quarter \$174.55 million, 3rd Quarter \$153.15 million, and 4th Quarter \$161.25 million.

## Around the Industry

**McKay Machine Co.**—merger of Federal Machine & Welder Co. with its parent company was recently approved by stockholders. Federal, a subsidiary of McKay since last November, will be known as the Federal-Warco Div. It will continue to operate at Warren, Ohio, under present management headed by J. R. Barefoot, president of Federal.

**Norton Co.**—the rights to two new machines which wafer and lap semiconductor materials, such as used in transistors, have been purchased by Norton's Machine Tool Div., which will sell and manufacture these units.

**Ex-Cell-O Corp.**—has established a direct factory sales and service office for the Southern Calif. area. Called Ex-Cell-O Machinery Sales, location will be the company's plant in Downey, Calif. Howard H. Schrock has been named district manager of the new office, which will handle Ex-Cell-O, Bryant, and Michigan Tool machines.

**Beckwith Machinery Co.**—has moved to Newlonsburg, Pa. New address is P. O. Box 8718, Pittsburgh 21.

**Sheffield Corp.**—has received orders from the American Steel & Wire Div., U. S. Steel Corp. and Bethlehem Steel Co. to design and

*(Turn to page 150, please)*

# INDUSTRY STATISTICS

By Marcus Ainsworth, STATISTICAL EDITOR

## WEEKLY U.S. MOTOR VEHICLE PRODUCTION

As reported by the Automobile Manufacturers Association

Make	Weeks Ending		Year to Date	
	April 29	April 22	1961	1960
<b>PASSENGER CAR PRODUCTION</b>				
Total—American Motors.....	7,816	7,761	102,253	179,694
Chrysler.....		2,227	29,143	33,353
De Soto.....				13,726
Dodge.....	3,045	3,526	37,769	148,041
Imperial.....		302	2,725	6,717
Lancer.....	1,242	1,628	13,207	
Plymouth.....	4,039	4,603	52,039	108,139
Valiant.....	3,066	3,379	34,678	97,816
Total—Chrysler Corp.....	11,383	15,665	109,561	407,594
Cornet.....	6,906	4,492	48,228	34,703
Falcon.....	11,123	12,472	141,677	172,803
Ford.....	19,705	19,709	290,208	404,560
Lincoln.....	842	860	11,110	8,850
Mercury.....	2,170	2,144	30,566	67,455
Total—Ford Motor Co.....	40,746	39,677	481,789	688,371
Buick.....	4,476	4,053	57,094	111,316
Buick Special.....	1,916	1,733	22,795	
Cadillac.....	3,388	3,390	56,771	61,149
Chevrolet.....	21,024	20,640	398,715	658,903
Corvair.....	6,489	7,818	114,637	113,245
Oldsmobile.....	5,385	5,283	77,387	148,567
Oldsmobile F-85.....	1,416	1,203	21,730	
Pontiac.....	5,318	4,861	74,117	171,211
Tempest.....	3,613	3,069	38,553	
Total—General Motors Corp.....	53,225	59,990	861,799	1,264,391
Total—Studebaker-Packard Corp.....	1,506	1,366	18,645	45,148
Checker Motors.....	151	146	1,941	2,550
Total—Passenger Cars.....	114,827	124,607	1,635,938	2,587,648
<b>TRUCK AND BUS PRODUCTION</b>				
Chevrolet.....	8,155	7,672	107,451	172,706
G. M. C.....	1,425	1,423	22,408	40,869
Diamond T.....	31	37	969	1,049
Divco.....		60	812	1,532
Dodge and Fargo.....	1,450	1,336	20,955	29,087
Ford.....	7,164	7,798	111,285	134,567
F. W. D.....	22	21	290	399
International.....	3,177	3,263	47,289	47,950
Mack.....	209	217	3,243	4,922
Studebaker.....	221	124	2,536	5,172
White.....	367	362	5,691	6,701
Willys.....	2,198	2,430	36,531	46,394
Other Trucks.....	80	80	1,280	1,753
Total—Trucks.....	24,499	24,943	360,340	493,021
Buses.....	110	110	1,205	1,318
Total—Motor Vehicles.....	138,136	149,560	1,997,533	3,081,967

## 1961 TRUCK TRAILER SHIPMENTS

Industry Division, Bureau of the Censors

Type of Trailer	Two Months		
	February	1961	1960
Vans			
Insulated and refrigerated.....	415	787	1,120
Steel.....	32	77	171
Aluminum.....	383	710	949
Furniture.....	70	134	316
Steel.....	60	121	291
Aluminum.....	10	13	25
All other closed-top.....	1,199	2,347	5,724
Steel.....	259	482	1,144
Aluminum.....	940	1,865	4,580
Open-top.....	158	334	601
Steel.....	41	84	194
Aluminum.....	117	250	407
Total—Vans.....	1,842	3,602	7,761
Tanks			
Non- and low-pressure			
Petroleum and aircraft refuelers			
Carbon and alloy steel.....	45	124	301
Stainless steel.....	15	32	42
Aluminum.....	109	203	337
Total—Petroleum.....	169	359	680
Chemical, food, and sanitary.....	55	87	116
Dry materials.....	49	74	172
High-pressure (LPG, chemicals, etc.).....	38	88	56
Total—Tanks.....	311	608	1,024
Pole, pipe, and logging			
Single axle.....	51	69	44
Tandem axle.....			138
Total.....	51	69	182
Platforms			
Racks, livestock, and stake.....	26	58	49
Grain bodies.....	54	114	297
Flats, all types.....	303	702	1,702
Total—Platforms.....	383	874	2,048
Low-bed heavy haulers.....	188	391	304
Dump trailers.....	196	232	208
All other trailers.....	216	436	582
Total—Complete Trailers.....	3,147	6,214	12,109
Dump trailer chassis <sup>1</sup> .....	23	40	172
Trailer chassis only <sup>1</sup> .....	251	423	464
Total—Trailers and Chassis.....	3,421	6,677	13,745
Detachable van bodies <sup>1</sup> .....	273	513	.....

<sup>1</sup> Sold separately.

## NEW PASSENGER CAR REGISTRATIONS BY REGIONS\*

Zone	Region	February		February	Two Months		Per Cent Change		
		1961	January 1961		1961	1960	Feb. over January	Feb. over Feb. 1960	2 Mos. 1961 over 1960
1	New England.....	18,904	19,987	25,172	38,891	45,450	- 5.42	-24.90	-14.43
2	Middle Atlantic.....	63,852	82,297	96,216	146,149	168,925	-22.42	-33.64	-13.48
3	South Atlantic.....	51,542	65,970	64,221	117,512	130,103	-21.87	-19.74	- 9.68
4	East North Central.....	83,901	86,477	121,781	170,378	238,226	- 2.98	-31.11	-27.58
5	East South Central.....	16,572	17,781	25,333	34,353	44,144	- 6.80	-34.58	-22.18
6	West North Central.....	32,474	35,194	40,335	67,668	72,924	- 7.73	-19.49	- 7.21
7	West South Central.....	36,418	36,933	41,293	73,351	77,358	- 1.39	-11.81	- 5.18
8	Mountain.....	13,346	16,168	15,826	29,534	31,679	-17.56	-15.67	- 6.77
9	Pacific.....	57,968	52,736	63,999	110,604	117,486	+ 9.73	- 9.58	- 5.86
Total—United States.....		374,877	413,563	494,178	788,440	924,294	- 8.87	-24.14	-14.70

\* Compiled from official state records. Data property of R. L. Polk & Co. May not be copied, sold or reprinted without Polk permission.

States comprising the various regions are: Zone 1—Conn., Me., Mass., N. H., R. I., Vt. Zone 2—N. J., N. Y., Pa. Zone 3—Del., D. C., Fla., Ga., Md., N. C., S. C., Va., W. Va. Zone 4—Ill., Ind., Mich., Ohio, Wis. Zone 5—Ala., Ky., Miss., Tenn. Zone 6—Iowa, Kan.,

Minn., Mo., Neb., N. D., S. D. Zone 7—Ark., La., Okla., Tex. Zone 8—Ariz., Colo., Ida., Mont., Nev., N. M., Utah, Wyo. Zone 9—Alas., Cal., H. I., Ore., Wash.

# BEAT THE WATCH

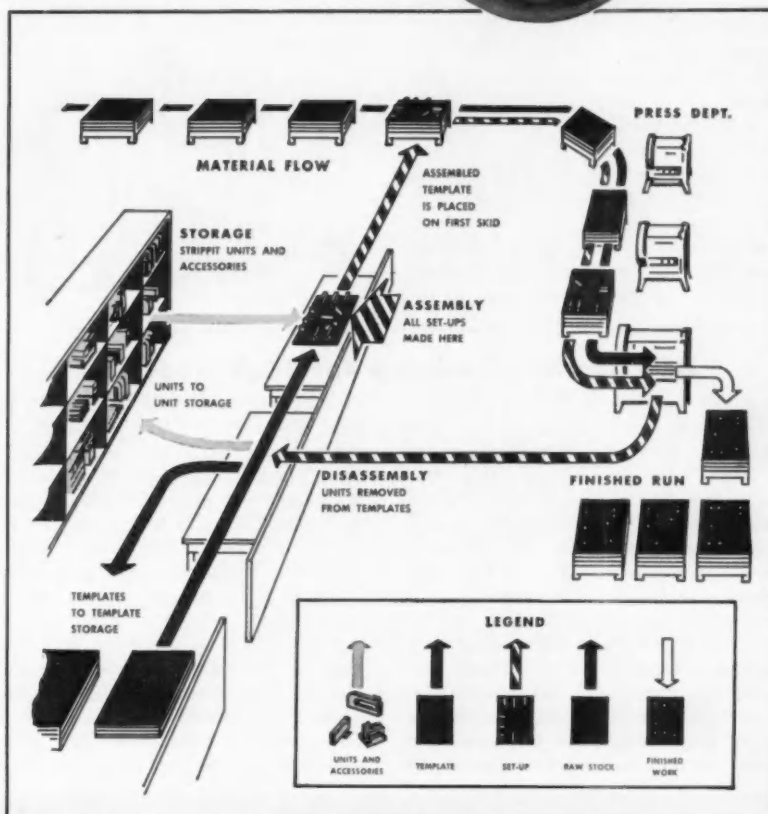
## with time-saving STRIPPIT hole punching units



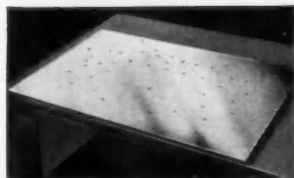
A stop-watch measures *dollars and cents* when it measures the time you spend setting up tooling. But the STRIPPIT System reduces hours to minutes and seconds... releases high bracket tool designers, die makers and die setters for work on more complicated dies involving forming, drawing and other operations.

All it takes is a good mechanic to make STRIPPIT setups on bedrails, T-slotted plates or drilled templates. The latter are particularly valuable in saving press down time because the complete setup can be inserted as soon as the previous press run is finished.

STRIPPIT self-contained hole punching units come in a multitude of sizes and capacities to meet any pattern requirement. Newest of these are the "BN" and "CJ" series which can be used for punching round or shaped holes. Also available are notching units and units for punching angles and extrusions. Write now for the STRIPPIT General Catalog.



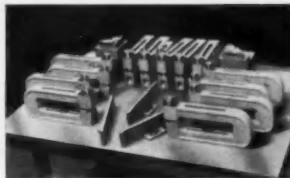
**Typical STRIPPIT setup takes only 25.33 minutes from work order to finished piece**



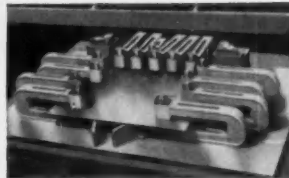
The STRIPPIT System begins with examining the blueprint, selecting the pre-drilled template and placing on setup table.



Feed rails and work stops are mounted securely to the template according to the size and the shape of the blank.



Notching units and hole punching units are mounted. Pilot pins concentric with punch assure precise positioning.



Complete setup is inserted in press and bolted down, shut height is adjusted and first piece punched and checked.

# WALES STRIPPIT INC.

242 Buell Road • Akron, New York

In Canada: Strippit Tool & Machine Company, Brampton, Ontario

In Continental Europe: Raskin, S. A., Lausanne, Switzerland

In the British Isles: E. H. Jones (Machine Tools) Ltd., Hove, Sussex, England

AUTOMOTIVE INDUSTRIES, May 15, 1961

Circle 143 on Inquiry Card for more data



# NEW

# PRODUCTION and PLANT

# EQUIPMENT

By C. J. Kelly

ASSISTANT EDITOR

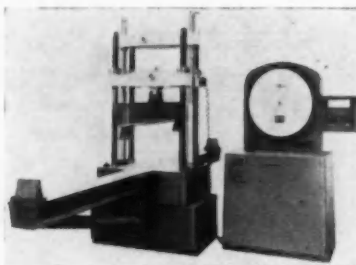
FOR ADDITIONAL INFORMATION, please use reply card at back of issue

## Testing Machine

**T**HIRD point transverse tests are made quickly and easily on specimens with spans up to 15 ft long with the new ElecTmatic testing machine.

Built-in arms extending to the front and rear of the machine have tee-slots that permit rapid adjustment of the self-aligning specimen supports to any standard span up to 15 ft. Load is applied from above the specimen by two hardened loading edges, which can be easily positioned as re-

quired to divide the span into three equal segments. This transverse tool,



attached to the movable crosshead by a wing nut, can be readily removed for conducting standard tension or compression tests with this wide clearance (30 in.) electro-mechanical testing machine.

Infinitely variable testing speeds of from 0.02 to 2 ipm are selected on the speed control dial without changing any gears. This speed is automatically maintained throughout the test by the variable speed electronic motor drive. Higher speeds to 20 ipm are available for adjusting the crosshead to accommodate specimens of varying lengths. *Tinius Olson Testing Machine Co.*

Circle 66 on Inquiry Card for more data

## New Machine Designed for High-Production

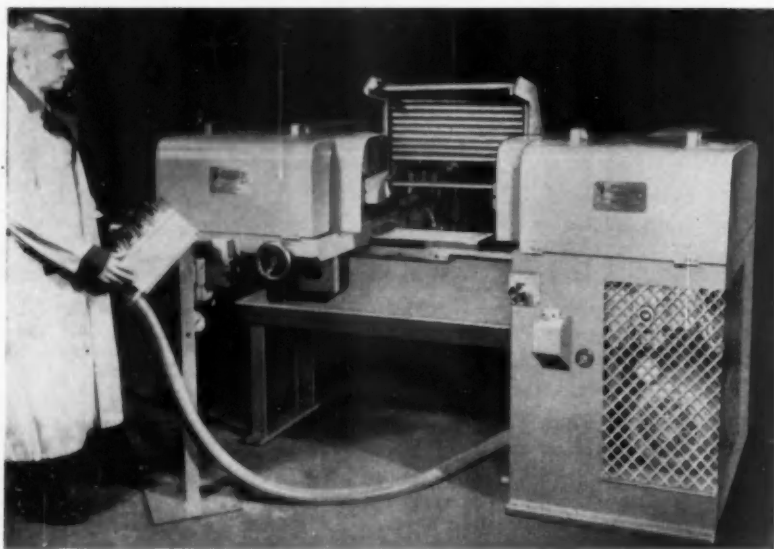
**M**ODEL 666 is a recently announced double end finishing machine that was especially developed for extremely high production. Other features are the ability to hold accurate workpiece length tolerances, maximum flexibility in the simultaneous finishing of both ends of tubes, rods, pipes and similar workpieces.

Typical operations include inside-outside deburring, chamfering and facing, and other light forming and pointing work such as chamfering screw machine stock. Featuring a high production speed and low unit cost, the unit will produce from 2300

to 3000 finished ends per hour, or from 1200 to 1500 finished parts.

The workpieces are automatically fed into machining position by the hydraulically actuated Chute-Matic feed mechanism. Length tolerances can be held to within 0.005 in. on a production basis. Diameters from 1/2 in. minimum to 3 in. maximum, in lengths up to 60 in., with the standard machine bed, and up to 120 in. with the extended machine bed can be handled by this machine. Adapters are available to handle work as short as 2 1/2 in. *Pines Engineering Co., Inc.*

Circle 67 on Inquiry Card for more data



Double end finishing machine features automatic operation and inexpensive tooling

## Compact Comparator

**M**ODEL 136B-2 is the designation given a new electronic comparator designed to check master rings and discs to an accuracy within 2 millionths of an inch. This comparator can measure inside diameters from 0.040 to 4.760 in., and outside diameters from 0 to 3.5 in. These measurements are made with a constant gaging pressure, since the contacts are mounted on a free-floating unit which eliminates all friction.



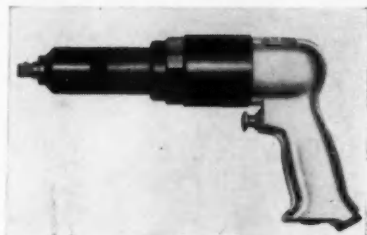
The amplifier is transistorized and battery-powered for greater reliability and instant operation with no source voltage fluctuation. The mercury cell battery pack provides 1200-1300 hours of service. When not required full time for checking masters in the gage laboratory, the completely portable amplifier can be used with an electronic gage head for other measuring applications. *Federal Products Corp.*

Circle 68 on Inquiry Card for more data



## Torque Control Clutch

Two models of pistol grip nutrunners and screwdrivers have been introduced to broaden the series 41F by Buckeye. The new devices are equipped with a torque control clutch. This clutch is adjustable to any torque from 5 to 100 in. lb. Clutch jaws automatically disengage when a pre-set torque is reached. As soon as the



tool is released from the work the clutch resets itself for the next fastener.

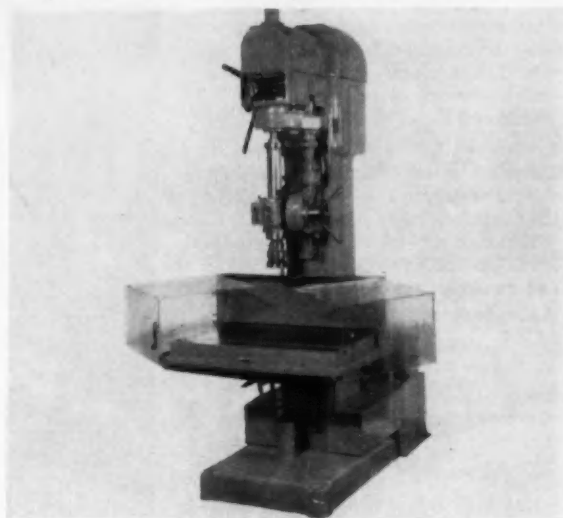
The nutrunner model has a  $\frac{3}{8}$  in. square drive front end; as a screwdriver, the tool has a  $\frac{1}{4}$  in. female hex spindle. The 41F series incorporates a motor that drives the clutch at a free speed of 1500 rpm. The units weigh less than 5 lb, and have an overall length of 10  $\frac{3}{16}$  in. The drive offset is 1 in. *Buckeye Tool Corp.*

Circle 69 on Inquiry Card for more data

## Hollow Spindle Variable Speed Drive

New speed drives, designed with special hollow spindles, have been introduced for operations that require drilling super-hard "exotic" materials. The unit features a transfer attachment for the introduction of coolant under pressure. Some of the materials, the RPMster, as it has been named, can successfully drill are titanium, stellite, rene 41 and stainless steel. It can also be utilized in drilling operations on some of the hardest new ceramic materials. The new unit is available in three sizes. *Buffalo Forge Co.*

Circle 70 on Inquiry Card for more data



## Parts Feeder Units

REPORTS from the manufacturer state that an interchangeable parts orientation segment on a new parts feeder line is the versatile feature that eliminates feeder obsolescence. The feeders were designed for application in the orienting, feeding and dispensing of numerous types of

small parts.

The TransfeRobot, as the units are known, are available in two bowl sizes—18 and 24 in. Each bowl is designed for fully interchangeable mounting of various orientation segments. *USI Robodyne Div., US Industries, Inc.*

Circle 71 on Inquiry Card for more data

## New Two Spindle Boring Machine Can Generate 21 Surfaces in One Operation

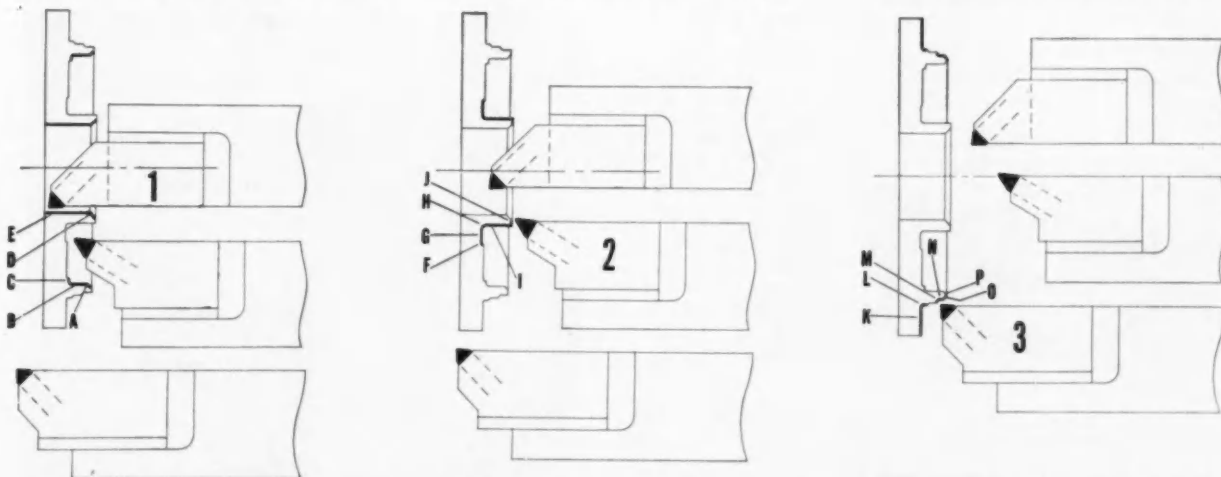
IN operation two parts are manually loaded. The table rapids to the left and tools number 1 generate the chamfer A, bore diameter B and generate the bottom radius C. After rapid traverse, the tools continue and generate chamfer D and bore diameter

E. At the completion of this stroke, tools number 2 are in close proximity to their start positions and immediately generate surfaces F through J. Tools number 2 having accomplished their cycle, tools number 3 face surface K, generate radius L, taper M,

turn N, chamfer O and generate an accurate radius at P.

All these individual cutting operations are performed in one rapid, continuous motion. Production is 100 parts per hour. *Ex-Cell-O Corp.*

Circle 72 on Inquiry Card for more data



Above is a typical machining operation that can be performed by a new two-spindle, cam operated precision boring machine. The manufacturer reports this unit is particularly well suited to machining operations where the accuracy of the workpieces tolerances are critical. Generating surfaces with a single point tool guided by an accurate master is the function of the new unit.

## Pneumatic Tapper

DEVELOPMENT of a new lightweight, pneumatically operated tapper, primarily designed for light tapping work in the sheet metal field, has been announced.

Perfected as an additional tool in the company's line, the model 400-T tapper is a pistol design tool for easy hand operation. The tool, complete with tapping chuck, weighs 3 lb.

Operating at 400 rpm, the spindle normally runs in a forward or right hand direction. The cutting direction of the tapper may be reversed by



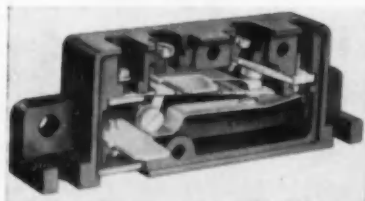
simply squeezing the reverse button in the handle. Releasing the button actuates the forward movement again. Air power is easily controlled by the convenient on-off valve located in the pistol-grip handle.

Capacity of the tool is number 10 to 5/16 in. USC or USF, and best results are achieved by using two flute gun taps. Noise level is held to a minimum through use of a muffled motor.

All internal parts are made from alloy steel, heat treated for maximum strength and long wearing properties. Shafts and gears run on anti-friction ball or roller bearings. The motor housing is made from a heat treated aluminum alloy casting to withstand rugged use. *Airtool Mfg. Co.*

Circle 73 on Inquiry Card for more data

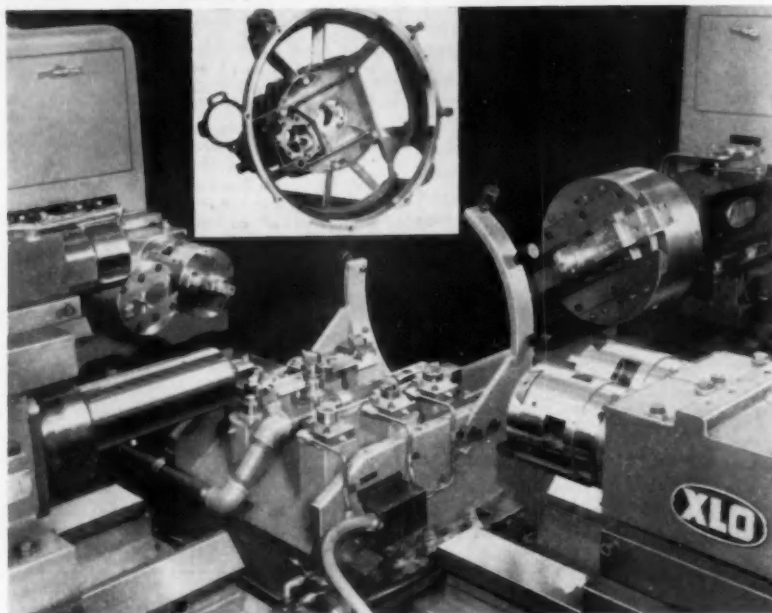
## Time Delay Relay



This thermal time relay delay is designed to simplify circuitry. These devices are available with SPDT-NC or NO contacts, two independent circuits or SPDT. The unit is rated at 100 milliamp to 10 amp, up to 115 V. ac. *E-T-A Products Co.*

Circle 75 on Inquiry Card for more data

## Four-way Boring Machine for Aluminum Crankcases



This precision 4-way boring machine was designed by Ex-Cell-O for a leading air-cooled engine manufacturer.

FIXTURING on this standard 4-way precision boring machine will accept two types of die-cast aluminum crankcases.

The machining operation is initiated by push button, whereupon the front and rear slides advance and finish bore and chamfer the opposing cylinder holes and finish face the cylinder mounting pads. Crankshaft bearing diameters are bored from the left side, holding a tolerance of

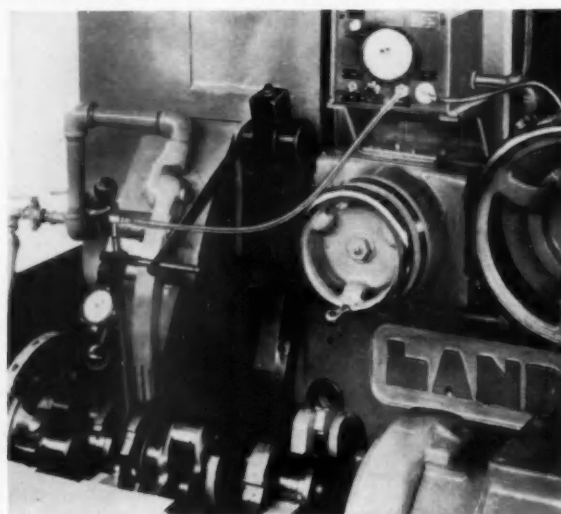
0.0003 in. Spindles mounted on the right slide finish bore, face and chamfer the large diameter housing. Tolerance on this 15-in. dia, which needs dampening because of its fragility, is held to within 0.003 in.

At the completion of the strokes all slides retract, the part is unclamped and the locating pins are withdrawn automatically. *Ex-Cell-O Corp.*

Circle 74 on Inquiry Card for more data

## Low-Cost Control Gage for Cylindrical Grinders

Known as the Econo-Sizer, a new, single limit control gage provides effective and reliable dimensional control, the manufacturer reports. This air-electric gaging unit has a power-handling relay which operates directly from the air-electric switch to initiate the control signal which retracts the grinding wheel. A built-in fail-safe feature provides a finish size signal should there be a power failure. With this gaging system there is cushioned response to work size variations so that minor surface irregularities which could improperly influence the control action of the gage do not affect it. *Federal Products Corp.*



Circle 76 on Inquiry Card for more data

# P review of the

## DESIGN ENGINEERING SHOW

**C**OGO HALL, the new convention center in Detroit, Mich., will host the 1961 Design Engineering Show and Conference, May 22 to 25. This year's exhibit and technical meetings will mark the first time the affair will be held in the Motor City. Attendance is expected to exceed 18,000. Some 4,000 experts will man the various display booths. The timely theme "Designing for the Competitive Market" brings attention to the reason this show and the concurrent meetings had their inception—the research and development of new products.

Top research engineers will represent numerous major manufacturers at the technical sessions. Because the show is being held in Detroit for the first time the opening conference will be devoted entirely to design engineering in the automotive industry. Ford, Chrysler, General Motors and American Motors executives will participate in this opening meeting.

The show will cover more than seven acres with over 400 manufacturers exhibiting \$10 million worth of wares. In excess of 100 companies will show new types of materials.

Two related papers will be presented at each of the sessions on the succeeding three days. Specific design problems will be considered at these sessions.

The Machine Design Division of the American Society of Mechanical Engineers sponsors the annual show and conferences. Show hours will be from noon to 5:30 p.m. each day except Tuesday when it will remain open till 10:00 p.m. The ASME has presented the Design Engineering Show and Conference annually for the past six years.

### Complete Conference Program

## "Designing for Today's Competitive Market"

MONDAY, MAY 22, 10:00 AM

#### AUTOMOTIVE SESSIONS

Opening Conference devoted entirely to design engineering in the Automotive Industries. Ford, Chrysler, General Motors and American Motors Executives participating.

"How a Car is Planned and Engineered to Meet Marketing, Purchasing and Quality Control Considerations" Will Scott, executive director of central product planning office, Ford Motor Car Co., Dearborn, Mich.

"Engineering Approach for Maximum Sales Value Per Unit of Cost" H. M. Bevans, executive engineer, Chassis-Electric Truck Engineering division, Chrysler Corp., Detroit, Mich.

"Production Engineering of the Design of the New Car" Conrad Orloff, production engineer, Chevrolet Motors division, General Motors Corp., Detroit, Mich.

"Role of the Supplier" Carl E. Burke, chief development engineer—automotive, American Motors Co., Detroit, Mich.

TUESDAY, MAY 23, 9:30 AM

#### four concurrent sessions

Session I "Designing for Production" C. E. Warner, manager, advanced manufacturing engineering service, and R. L. Berg, consultant-productibility engineering, both of General Electric Co., Schenectady, N. Y.

"Materials Standardization to Reduce Costs" Gerald L. Swartwood, materials engineer and drafting supervisor, Bryant Electric Co., Bridgeport, Conn.

Session II "Special Requirements of Hydraulic Systems for Servo Control of Machinery" Robert K. Sedgwick, assistant chief engineer, servo division, Kearney & Trecker Corp., Milwaukee, Wis.

"Drives for Tape-Controlled Machine Tools" George W. Younkin, chief development engineer, Giddings & Lewis Machine Tool Co., Fond du Lac, Wis.

Session III "Glass, Ceramics and Glass-Ceramics" Marvin G. Britton, technical manager, Corning Glass Works, Corning, N. Y.

"Designing Parts to be Made of Glass, Ceramics or Glass-Ceramics" J. R. Blizzard, manager, product engineering department, technical products division, Corning Glass Works, Corning, N. Y.

Session IV "High-Strength Steels, Their Characteristics and Workability" Ray A. Lula, chief research metallurgist, stainless steel, research center, Allegheny Ludlum Steel Co., Pittsburgh, Pa.

"Design of Structural Members Made by Forming High-Strength Steel Sheet" Richard H. Marvin, chief engineer, space atomics section, The Budd Co., Philadelphia, Pa.

WEDNESDAY, MAY 24, 9:30 AM

#### four concurrent sessions

Session V "Motors at High Temperatures for Industrial Usage" Frank C. Rushing, engineering manager, motor and gearing department, Westinghouse Electric Corp., Buffalo, N. Y.

"Application of Non-Excited Synchronous Motors" J. P. Landis, electromechanical development section, mechanical development laboratory, E. I. du Pont de Nemours & Co., Wilmington, Del.

Session VI "Design and Drafting for Parts Manufacturing on Numerically Controlled Production Equipment" Alexander Taleff, equipment development engineer, headquarters manufacturing laboratory, Westinghouse Electric Co., Pittsburgh, Pa.

"Cost vs. Value of Small Tolerances and Smooth Finish" W. W. Gilbert, manager, machining development, manufacturing services, General Electric Co., Schenectady, N. Y.

Session VII "Adhesives, Types and Characteristics" W. C. O'Leary, technical director, adhesives, coating and sealers division, Minnesota Mining & Manufacturing Co., St. Paul, Minn.

"Design with Adhesives" A. F. Charter, director of research, A. O. Smith Co., Milwaukee, Wis.

Session VIII "New Developments in Types of Fasteners" John Stoutenburg, vice-president, Robin Products Co., Warren, Mich.

"Designing with Powder Metallurgy to Improve Quality and Reduce Cost." Paul J. Failla, general superintendent machine shops, Johnson Bronze Co., New Castle, Pa.

THURSDAY, MAY 25, 9:30 AM

#### three concurrent sessions

Session IX "Filament Wound Pressure Vessels" Richard Gorcey, group leader, solid propulsion components, Rocketdyne, a division of North American Aviation, Inc., Canoga Park, Calif.

"Design of Plastic Parts for Strength and Durability" R. L. Thorkildsen, mechanical behavior engineer, general engineering laboratory, General Electric Co., Schenectady, N. Y., and J. V. Schmitz, major appliance laboratory, major appliance division, General Electric Co., Louisville, Ky.

Session X "Visco-Elastic Damping" D. K. Hatch, Monsanto Chemical Co., Springfield, Mass.

"Method of Analysis for Gears" Merriwether Baxter, chief research engineer, Gleason Works, Rochester, N. Y.

Session XI "Moly-Disulphide Lubricants" K. B. Wood, chemical director, Climax Molybdenum Corp., New York, N. Y.

"Moly-Disulphide as a Grease Additive" H. G. Rudolph, Jr., automotive division, products department, Socony Mobil Oil Co., New York, N. Y.

*Quantity*  
**PRODUCTION**  
*of*  
**GREY IRON CASTINGS**

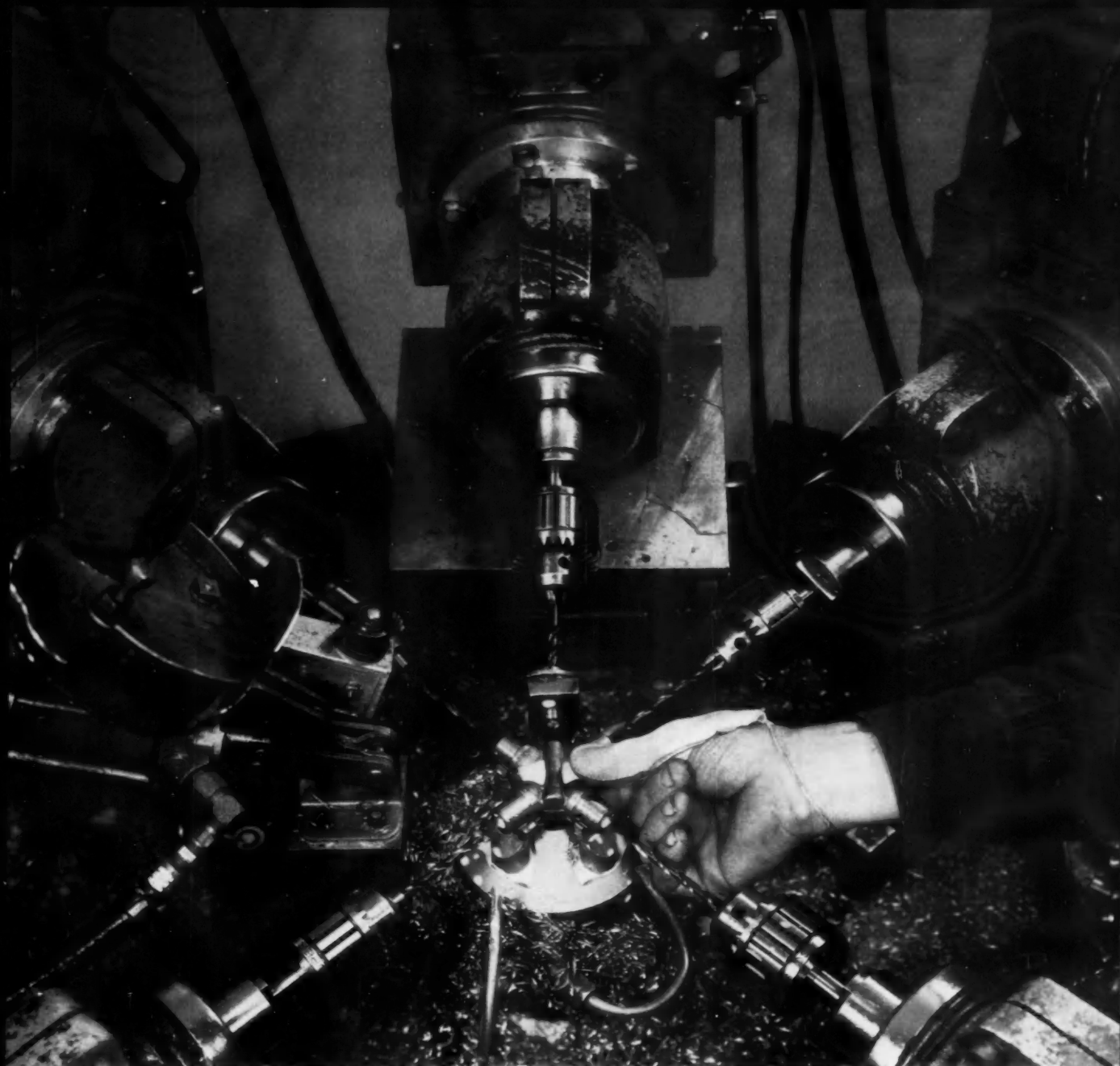
ONE OF THE NATION'S  
LARGEST AND MOST MODERN  
PRODUCTION FOUNDRIES

ESTABLISHED 1866

**THE WHELAND COMPANY**  
**FOUNDRY DIVISION**

MAIN OFFICE AND MANUFACTURING PLANTS  
**CHATTANOOGA 2, TENNESSEE**





### **FAST AS THE EYE CAN FOLLOW**

Drilling five 1½" deep holes at once in forged steel "spiders" for universal joints, these drills move in and out about as fast as the eye can follow on this high production job at the Saco-Lowell Automotive Division plant in Saco, Maine.

At this speed, even a few minutes down time means considerable loss of production. That's why they insist on quality tools, tools they can depend on to stand up day in and day out, month after month, tools that are uniform order after order.

Specially researched GREENFIELD-AMPCO drills have been on this operation longer than any other make in the long history of this gruelling job.

**GREENFIELD TAP & DIE** GREENFIELD, MASSACHUSETTS



## With the right woven pile from Schlegel

Moving this window up or down strains neither muscle nor motor.

This is a significant accomplishment, considering the glass variances in today's automobile windows. How does Schlegel pile liner make the job so effortless—yet still effectively seal out the elements and eliminate window noise?

The answer is yours. You select the glass run channel and specify Schlegel woven pile liner. We furnish the channel manufacturer with pile fabric of the correct specifications.

Our work doesn't end there. We give you a quality pile which will retain its wear-resistance for years and years to come.

To you (and your car-buyer), Schlegel woven pile liner means easier window movement, rattle-free windows and better sealing qualities. It hugs the glass surface evenly, flexing against wavy surfaces to hold a constant seal.

If that sounds good enough to make you want the best, be sure your next glass run channel utilizes Schlegel woven pile liner. You'll be in good company. Automotive engineers have been specifying Schlegel pile liner since glass windows were first used in cars.



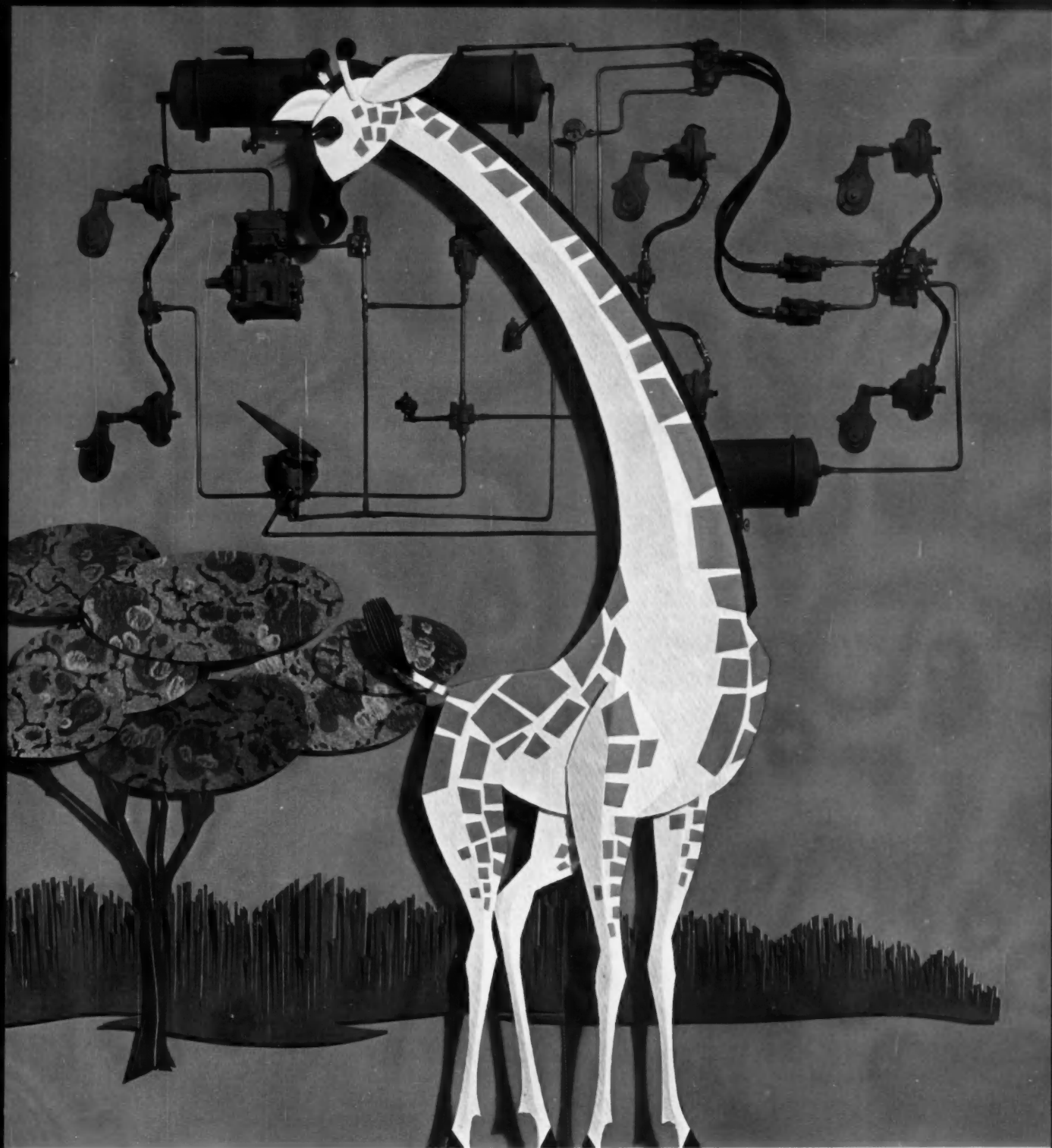
Glass moves friction-free, wet or dry, in this glass run channel with Schlegel woven pile

# Schlegel

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**SCHLEGEL MANUFACTURING COMPANY**

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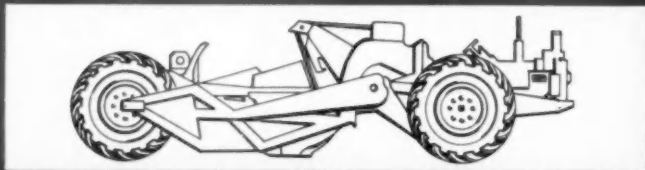
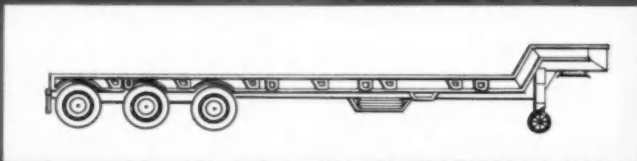
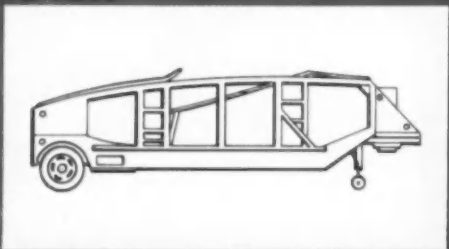
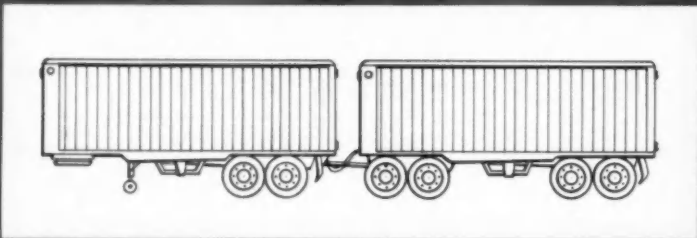
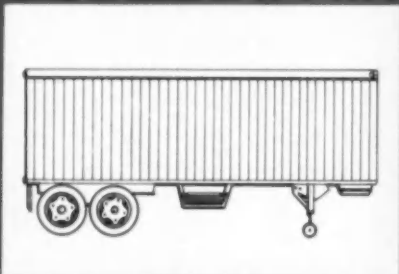
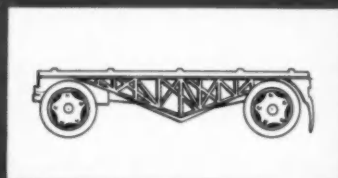
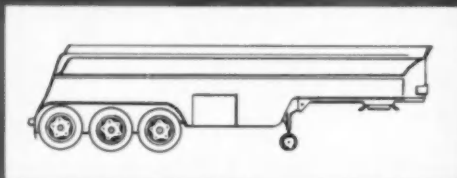
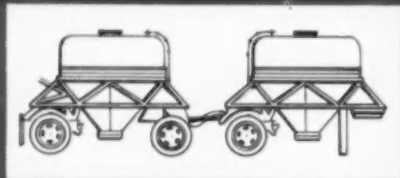
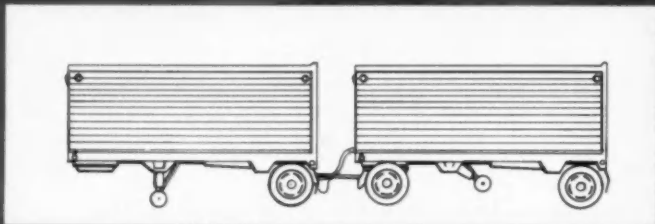
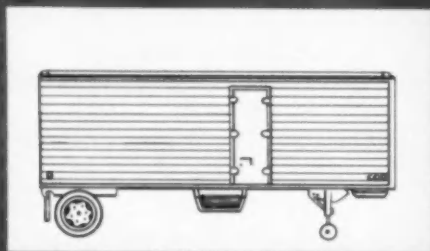


**HIGHEST STANDARDS IN AIR BRAKES, TOO.** The giraffe's built-in ability to reach high is unique among animals. Similarly, among air brakes, Bendix-Westinghouse systems have a capability and reputation unique in the industry for reaching highest performance standards. Among the reasons: dependable design; system-engineered components that give balanced performance; exacting manufacturing standards; and closely maintained quality control. Another bonus benefit: The reputation for customer service earned by Bendix-Westinghouse through 38 years of close and constant association with the transport industry. That's why you can buy with complete confidence when you specify Bendix-Westinghouse Air Brakes—the product and name you can trust.

SPECIFY COMPLETE AIR BRAKE SYSTEMS BY

***Bendix-Westinghouse***





*From single axle to double bottoms . . .*

## **BENDIX-WESTINGHOUSE SYSTEM ENGINEERING meets every kind of trailer Air Brake need**

When specifying trailer air brakes, here are three important facts worth keeping in mind.

First, there's a complete Bendix-Westinghouse Air Brake System available for every type and make of trailer.

Second, Bendix-Westinghouse brakes are system-engineered so that all components work together best for maximum operating dependability and economy.

Third, these braking systems are designed for balanced performance with Bendix-Westinghouse tractor braking systems—together forming an unbeatable braking "team".

Still another Bendix-Westinghouse "plus" is the new

RE-4 Relay Emergency Valve. By providing constant output over a wide temperature range and assuring immediate pressure balance of tractor and trailer braking systems, it provides a new standard of safety and performance. And it's simple to maintain because its emergency piston assembly can be replaced in minutes. Now available in exchange for your present relay emergency valves on a low-cost changeover plan. See your authorized distributor.



***Bendix-Westinghouse***

AUTOMOTIVE AIR BRAKE COMPANY

General offices and factory—Elyria, Ohio. Branches—Berkely, Cal., and Oklahoma City, Okla.





# NEW

# PRODUCTS

## AUTOMOTIVE-AVIATION

FOR ADDITIONAL INFORMATION, please use reply card at back of issue

By C. J. Kelly  
ASSISTANT EDITOR

### Non-Friction Bearing

A new compact non-friction device has been designed to take the place of ball bearing assemblies and jewels in numerous applications in the industrial and aero-space fields. Called a Flexural Pivot, this device is a new design of the more complicated cross-spring pivot, the manufacturer reports.

In operation the unit has flat steel springs that form, what was referred to as "a sort of web," between two separated halves of a tubular bearing, and it is their flexing that allows movement—up to 60 deg arc—with no rubbing of one part against another. Utica Div., The Bendix Corp.

Circle 50 on Inquiry Card for more data

### Medium-Impact Phenolic

A two step, cellulose-reinforced compound which can be transfer or plunger molded features excellent preforming and molding characteristics, the manufacturer reports. It has been designated RX 522. Among its properties are a bulk factor of 2.8 to 1, impact strength of 0.4 (min) psi, tensile strength of 8000 (min) psi, water absorption rate of 0.5 pct, and a short time dielectric strength of 300 (min) vmp. This new material is recommended for use in all types of automatic molding equipment and will mold into a lustrous, black finish. Rogers Corp.

Circle 51 on Inquiry Card for more data

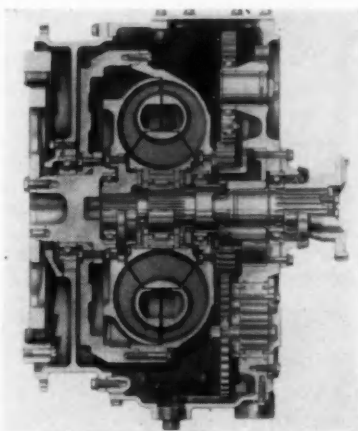
### New Coupling Material

A new material has been developed specifically for flexible coupling inserts, but has been found useful in many diversified applications. It can be manufactured and fabricated to meet any specification, the manufacturer reports. Known as Elastine, this material has good ability to minimize shock from torque load. Shureclose Seal Co.

Circle 52 on Inquiry Card for more data

### Torque Converters

An infinite number of torque-speed ratios are available for off-highway equipment with the use of new specially designed torque converters. The new devices can be utilized on tractors, loader graders, rollers, stationary power units, industrial drives and other various equipment.



The converters will handle loads from 100 to 700 hp and have torque multiplication ratios from 2.3:1 to 3.5:1. Sizes range up to 18% in. in dia. The units are single stage, 3-element type with or without automatic over-running members for fluid coupling operation. Drive can be directly to flywheel or flexible rubber-drive coupling. Rockford Clutch Div., Borg-Warner Corp.

Circle 53 on Inquiry Card for more data

### Insulating Foam

Urethane insulating foam, recently developed, provides dimensional stability at sub-zero temperatures in a low density formulation. The material eliminates shrinkage in the low temperatures the manufacturer reports. Overall density of Lockfoam H-602, as it has been designated.

Lockfoam has a K-factor of 0.013. (K-factor = Btu/hour/sq ft/deg F/in. at 75 deg F mean temperature.) Nopco Chemical Co.

Circle 54 on Inquiry Card for more data

### Large Flange Rivet

Large flange "pop" rivets are reported by the manufacturer to be particularly well suited for fastening operations where soft materials, including wood, are involved. This new, all aluminum rivet has a 3/16 in. dia mandrel and a flange dia of 5/8 in. Some applications where the new rivet can be utilized are in paneling operations on truck and trailer where plywood liners are used.

A feature of the pop rivet is the ability to set it when there is no access to the reverse side. Pop Rivet Div., United Shoe Machinery Corp.

Circle 55 on Inquiry Card for more data

### Cemented Carbide

Long wearing ability and good shock resistance are reported to be features of three new grades of cemented tungsten carbides which were designed to cover a wide range of metalworking operations. The three new grades have been designated CA-704, CA-711 and CA-720.

The manufacturer said the 700 line of carbide tools are suitable for numerous steel-cutting jobs ranging from precision boring and fine finishing to heavy and interrupted cuts. Carnet Div., Allegheny Ludlum Steel Corp.

Circle 56 on Inquiry Card for more data

### Neoprene Adhesive

A new general purpose neoprene contact adhesive for bonding a wide variety of materials, giving bonds that have high peel strength, and good water resistance has been developed.

Known as Armstrong D-239, this adhesive is a yellow air drying solvent material with synthetic rubber base. It has the consistency of thin syrup and may be applied by brush, spray or roller coating. According to the manufacturer it has good resistance to fatigue or "dead load" and has excellent aging properties. Industrial Div., Armstrong Cork Co.

Circle 57 on Inquiry Card for more data

## Aluminum Pistons

This aluminum piston is capped with a thin layer of stainless steel. The experimental ferrous cladding is one piston design and material change produced in a search for "a better way." Although the piston has not



been engine-tested, it has been sectioned for study of the pressure bond, a process for which the manufacturer holds basic patents. This piston was developed at the *Cleveland Laboratories of the Aluminum Company of America*.

Circle 58 on Inquiry Card for more data

## New Axle Suspension

A new suspension for tandem axles requires no lubrication and has its spring ends encased in rubber. The rubber sections are used in conjunction with the suspension's moving parts. This suspension was designed to provide a smooth ride.

Other paramount features of the new tandem axle suspension are simplicity of design for maximum ease of maintenance, interchangeability of parts and lightweight characteristics. This new device has a single mount on each side which ties directly to the truck frame rails. Incorporating 50 in. springs, this suspension system weighs 761 lb. *Eaton Mfg. Co.*

Circle 59 on Inquiry Card for more data

## New Premium Tire

A new premium passenger car tire is reported by the manufacturer to incorporate major tread design advances. This tire has new tread design on the outside and stronger nylon cord inside for blowout safety. Known as the Ultra M 200, its features include a 5 rib tread design which has been increased in overall width. *Lee Rubber & Tire Corp.*

Circle 60 on Inquiry Card for more data

## Fiber Glass Panels

A new development in refrigerator truck and trailer liners is modular panels molded entirely of fiber glass reinforced plastics with integral air-circulating ribs and a nesting edge for efficient installation.

These panels offer reefer body builders and operators the advantages of molded fiber glass as a hard-wearing gloss-white surface, easy cleaning and maintenance, excellent thermal insulation, high strength and rigidity

at high and low reefer operating temperatures, and quick in-place repair in case of fork-lift damage.

These MFG panels are now available in two sizes: 37½ by 84 in. and 49½ by 84 in. Both are 0.120 in. thick. The smaller panel has 4 ribs on 9 in. centers; the larger unit 6 ribs on 8 in. centers. Precise dimensions and a highly finished surface are assured through the use of matched metal dies for the molding of these panels. *Molded Fiber Glass Body Co.*  
Circle 61 on Inquiry Card for more data

## Compact Electrical Car for Industrial Use

A new compact electrical car has been specifically designed for industrial service. The 182 lb car is 30 in. wide and is suitable for transporting plant executives, roving inspectors and maintenance men. It is also ideal for in and around plant delivery service. A trailer is available and is capable of carrying loads up to 200 lb. The car itself will haul the operator and has an integral carrying space for loads up to 100 lb, or an additional passenger. This space is 13 by 17 in. and is 7 in. deep. The car measures 53 in. long, 33 in. high with a 3¼ in. road clearance. The trailer is 26 in. wide, 50 in. long.

The three wheel Delwick electric car is driven by a special 12 V electric motor that is operated by a foot switch. The motor is powered by a 12 V lead-acid battery which is equipped with a trickle charger. The car can be operated for a full shift and then recharged by plugging the trickle charger into a 110v circuit. The battery charger will recharge a fully discharged battery in 12 hours.

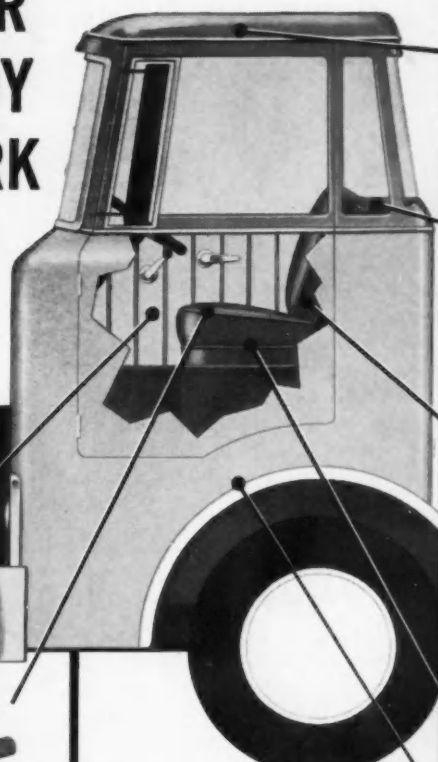
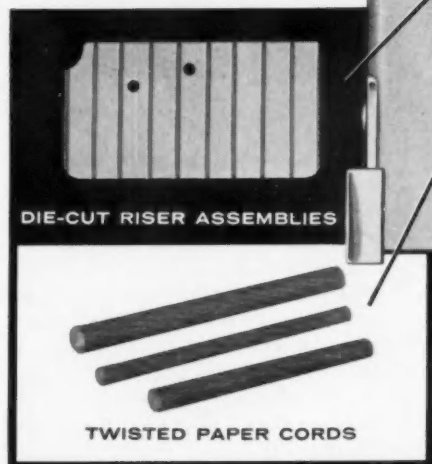
The forward speed of the car is factory-set at 5 mph. The frame is welded tubular steel and body one piece molded fiberglass. *Namisco, Inc.*  
Circle 62 on Inquiry Card for more data

(Turn to page 154, please)



New in-plant electric car has a turning radius of 60 in., and has 10 by 3.50-4 tires

# INTERIOR ? BODY WORK PROBLEMS



*...and hundreds  
of other stock and  
custom materials  
for functional or  
decorative interior  
body use!*

## Sackner

**SOLVES YOUR INTERIOR BODY  
WORK PROBLEMS WITH  
VERSATILE FIBRE AND PLASTIC  
MATERIALS PLUS A COMPLETE  
PRODUCT DEVELOPMENT  
ENGINEERING SERVICE!**

As suppliers to every major passenger car manufacturer, Sackner has developed a wide range of products for upholstery, padding and trimming automotive body interiors. Most of these were engineered to fill a specific need . . . to solve a particular problem. We have 45 years experience . . . all the necessary know-how to engineer fibre and plastic material to meet your need . . . let our experienced Product Development Staff assist you! Submit details of your requirements, today, for free analysis and recommendation.

**SACKNER PRODUCTS, INC.**  
WORLD'S LARGEST MANUFACTURERS AND  
CREATORS OF SPECIALIZED FIBRE PRODUCTS

- **NON-WOVEN PADS** Dielectric, non-dielectric . . . needled or non-needled pads for door panels, kick pads, etc. Stock or custom specifications. Natural or synthetic fibres.
- **WOVEN PAPER FABRICS** Tough, durable, attractive fabrics of twisted paper cord, for package trays, trunk liners, headliners, etc.
- **TWISTED PAPER CORDS** Perfectly uniform diameter for a neat, trim welt every time . . . twisted kraft, creped tissue or braided cords. Rugged durability at low cost.
- **DIE-CUT RISER ASSEMBLIES** Pre-formed, pre-assembled panels, die cut to exact shape for padded doors, etc. Rich quilted design effects . . . low installation cost.
- **PAPER COVERED WIRE STAKE** Steel wire with a twisted kraft cover, for stabilizing spring assemblies. Strong and "squeak-proof."
- **PLASTIC EXTRUSIONS** Decorative trim or functional parts in any shape, length, size, color or degree of hardness specified. Complete engineering service.
- **BODY DUST SEALS** Large-diameter cellulose cords, with braided jacket, to seal off welded seams, etc. Uniform in shape and density.

901 OTTAWA AVE., N.W., GRAND RAPIDS 2, MICHIGAN

AT HIGH POINT  
SACKNER SOUTHERN, INC.  
2441 ENGLISH STREET

AT LOS ANGELES  
SACKNER WESTERN, INC.  
2161 SACRAMENTO STREET

1-4

# ..... Trends in the CONSTRUCTION EQUIPMENT INDUSTRY

By  
**Kenneth  
Rose**

**T**HE Interstate Highway program, once more in financial hot water, will need additional funds to the tune of about \$900,000,000 per year if it is to be finished by fiscal 1972, as planned. Pres. Kennedy has proposed that these funds be raised by heavy tax increases on Diesel fuel and on trucks that weigh over 26,000 lb when loaded, with lighter tax increases on highway tires, inner tubes, and tread rubber.

Meanwhile, Federal Highway Administrator Rex M. Whitton has announced that, as of the first of this calendar year, 10,440 miles of the interstate Highway System were already open to traffic, with another 4126 miles under construction. Of the mileage of the system now in use, 5135 miles were completed to required standards, and 3041 miles were completed to current standards but will need additional improvements to bring them up to the standards for 1975 traffic, as required by the original Highway Act of 1956. Toll roads, bridges, and tunnels incorporated in the system as permitted by law totaled 2264 miles.

Adding to the mileage completed and under construction another 10,032 miles on which engineering or right-of-way acquisition was in progress brings the grand total to 24,598 miles completed or begun.

This means that some work has been done on about three-fifths of the 41,000-mile system. Nearly \$10 billion has been put to work on the Interstate System since the program began four and one-half years ago. Work completed since July 1, 1956, has cost \$4.66 billion. Work authorized or underway as of Jan. 1, 1961, was estimated to cost \$5.24 billion, of which \$3.27 billion was for construction and \$1.97 billion for engineering and right-of-way acquisition.

## Largest A-C Tractor Loader

Allis-Chalmers Mfg. Co. has announced a new tractor loader, the TL-30, to increase its line of these machines to six. The new model, with a maximum lifting capacity of 25,000 lb and a carrying capacity of 10,500 lb, is the largest in the Allis-Chalmers line.

Equipped with four-wheel drive, the new tractor loader is powered by an Allis-Chalmers turbocharged Diesel engine, Model No. 11000, rated at 184 hp at 2200 rpm. A single lever permits power shifting while moving at any speed and in either forward or reverse direction. The operator can move easily into a stockpile of material, instantly drop into low crowding speed for full-capacity loading, then reverse

direction instantly. The machine has a breakout force of up to 28,000 lb.

Six buckets, ranging from 2½ to 6 cu yd, are available for the TL-30. Maximum dumping clearance is 10 ft 4½ in., with a 37½ in. reach forward from the tires for center loading of high, wide truck bodies. Special buckets, backfiller blade, bucket teeth, and log tongs are available if desired.

Hi-traction differentials, to transfer power to the wheel with the best footing, and an automatic

*(Turn to page 108, please)*



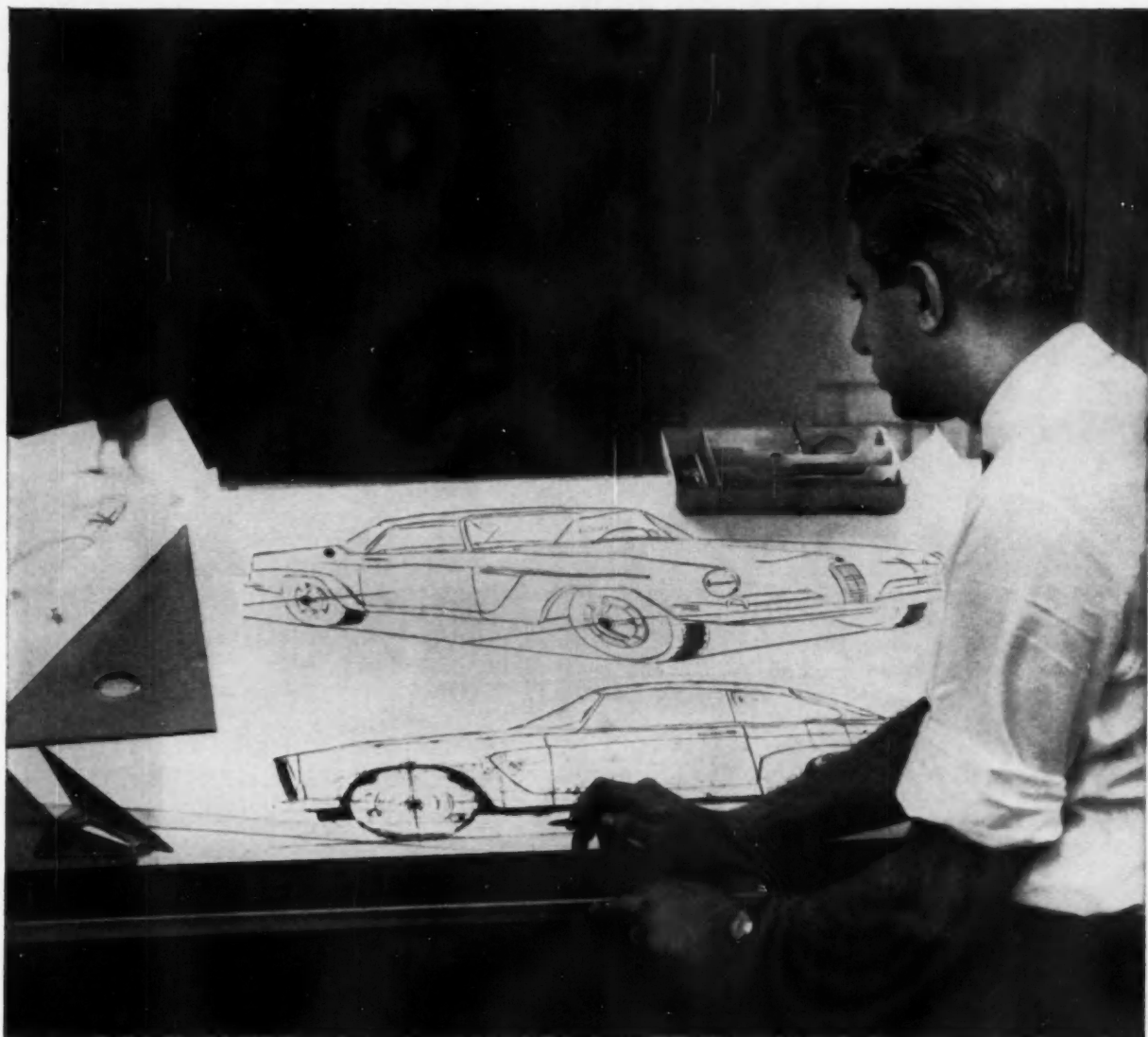
**Crenlo Standard  
heavy duty cab**



**Allis-Chalmers TL-30 tractor loader**



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information, contact Enjay's Detroit Area Office, 17360 West Eight Mile Road, Southfield, Mich. Phone KENwood 2-7113.

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A DIVISION OF HUMBLE OIL & REFINING COMPANY



## Report from the

# FARM EQUIPMENT INDUSTRY

By Kenneth Rose

MID-WEST EDITOR

**W**HAT is probably the world's largest farm tractor will go into limited production by International Harvester Co., with first units scheduled to come off the lines in May or June. As a result of successful field testing of two experimental units for some months, the company has scheduled production of 12 more of the giants. Like the two pioneer machines, these will go to the Pacific Northwest, where large acreage grain farmers have shown interest in the huge agricultural prime movers.

It is the tractor's ability to tow implements of high capacity that has won the attention of large acreage farmers. The machine will pull ten plow bottoms, or a 40-ft chisel plow, or wider hitches of drills, harrows, one-ways, and other field equipment than ever was possible before. The 385-hp Diesel engine gives it a drawbar hp conservatively rated by the company at 180 hp. The 8-speed transmission provides six field working speeds of from 3.5 to 7.6 mph, and two transport speeds of 14.3 and 22.7 mph. The transmission is available with or without a torque converter with positive lock-up clutch.

In addition to four-wheel drive, the tractor provides three types of steering. Conventional steering is used for highway or most field work, while four-wheel steering can

be used to give the machine a short turning radius under full power. Crab steering is useful for hillside operations, preventing down-slope drift.

Development of the tractor, designated the 4WD-3 by International Harvester, marks another invasion of the crawler field by rubber-tired wheels. Agricultural crawlers had been used for towing wide hitches of implements in the grain fields. Farmers have found that the rubber-tired model, with adequate power to do the field work of the crawler, is more versatile in that it can be driven over the highway from location to location at good speed.

The new units will sell for about \$35,000 and higher, depending upon features ordered. Production will be started at the Frank G. Hough Co. plant at Libertyville, Ill., a subsidiary of Harvester.

## Low-Profile Tractors

Two grove and orchard tractors have been added to International Harvester's agricultural line. They are designated International 340 and International 460, and are designed exclusively for work in orchards, with low profile and complete shielding. Other features that make the tractors especially fitted for work among bearing trees are the low rear platform, seat designed to enable the operator to sit or stand, and low vertical plane steering wheel. Crown fenders, with removable skirts and front cones, let limbs and fruit slide over the tractor without hook-up or bruising. Wheels have been redesigned to permit attaching wheel weights within the tire width, and to eliminate any protuberance that might damage trees. The lever-type overcenter hand clutch is efficient when working under low-hanging limbs. Controls are conveniently located. The tractors are modifications of Harvester's International 340 and 460 models respectively.

(Turn to page 104, please)



International Harvester's giant farm tractor, scheduled for limited production.



New Model 1-340 Orchard and Grove tractor, recently added to the line of International Harvester Co.



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Stainless by

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where a fine finish is only the beginning

## Farm Equipment

(Continued from page 102)

### Farm Income Up

Farm income, an important factor in farm equipment sales, showed a steady rise during 1960, with the annual rate of realized net farm income for the fourth quarter estimated at \$12.4 billion, nearly 15 per cent above the fourth quarter of 1959. For the year as a whole, realized net farm income totaled

about \$11.6 billion, 3 per cent above 1959's \$11.3 billion, but still 11 per cent less than the \$13.0 billion of 1958.

The increased income was derived from record volume of marketings of farm commodities at slightly lower average prices. The volume of crops marketed in 1960 was about 4 per cent above the 1959 volume.

Farm income in 1961 is expected to increase substantially, with gross income rising above \$13 bil-

lion, the highest since 1953. Most of this will be the result of higher government price supports, however.

### New Motor Freight Classification

A change in the National Motor Freight Classification as of March 16 will permit shipments in containers of iron or steel tractor parts to include up to 20 per cent of such other parts as are made of aluminum, brass, bronze, copper, plastics, and zinc, at the lower rate for the iron and steel shipment. Formerly such other metals had to be an integral part of the iron or steel tractor part to be included at the lower rate, and to be of no more than 20 per cent of the total weight.

The liberalization of the classification was arranged for by Farm Equipment Institute through its members on the board controlling motor freight classification. ■

• • •

### Track Roller Casting

Production of a track roller for crawler tractors made as a single casting was described at the 59th annual meeting of the Steel Founders' Society of America in Chicago. The meeting also marked the 100th anniversary of the first casting of steel in this country.

American Steel Foundries reported that its Indiana Harbor plant has turned out a track roller as a single 200-lb steel casting, replacing a welded and machined assembly of two forgings.

The company also disclosed workers at its research laboratory were pouring steel in 10-ton batches directly into slabs 14 ft long, 3½ ft wide, and five in. thick, to be rolled into sheet for automobile tops, bodies and fenders.

Also discussed were a process for preparing steel sheet for automotive use, new cast ripper teeth, and alloy steel castings for aircraft and missile programs.

Several companies reported newly designed castings for piggy-back railway cars. Most are designed to lower the car deck or to strengthen couplings.

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for vibration-proof  
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**--operations--space--weight--assembly time**

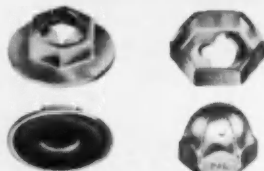
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**65 SERIES: RATIOS**

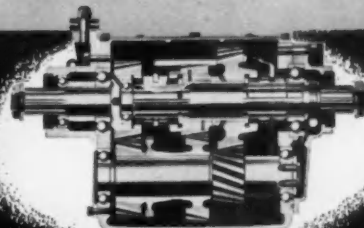
SPLITTER RATIOS and DEEP REDUCTIONS		3-A-65	3-B-65	3-C-65	3-D-65	3-E-65	3-F-65	3-G-65	3-H-65
	High	.754	.804	.754	.804	.804	.754	1.00	1.00
	Intermediate	1.00	1.00	1.00	1.00	1.00	1.00	1.32	1.32
	Low	2.221	1.239	1.239	2.221	1.74	1.74	2.221	1.74

**For HEAVY DUTY, offer the Fuller 92 Series 3-speed Auxiliary**

**92 SERIES: RATIOS**

SPLITTER RATIOS and DEEP REDUCTIONS		3-A-92	3-B-92	3-C-92	3-D-92	3-E-92	3-F-92	3-G-92	3-H-92
	High	.74	.84	.75	.75	.84	.84	1.00	1.00
	Intermediate	1.00	1.00	1.00	1.00	1.00	1.00	1.327	1.327
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Single-unit NYLOK Bolts and Nuts are easy to apply manually or automatically, can be used over and over. NYLOK Nuts are double-chamfered to permit automatic feeds at top production speeds, save time and money.

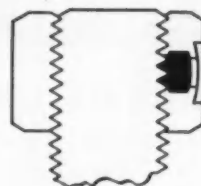
Check your product for applications where NYLOK's positive holding power can do the job better, save you money. For sizes, prices, and application data on NYLOK Bolts and Nuts, contact your Republic Dealer, or send the coupon.



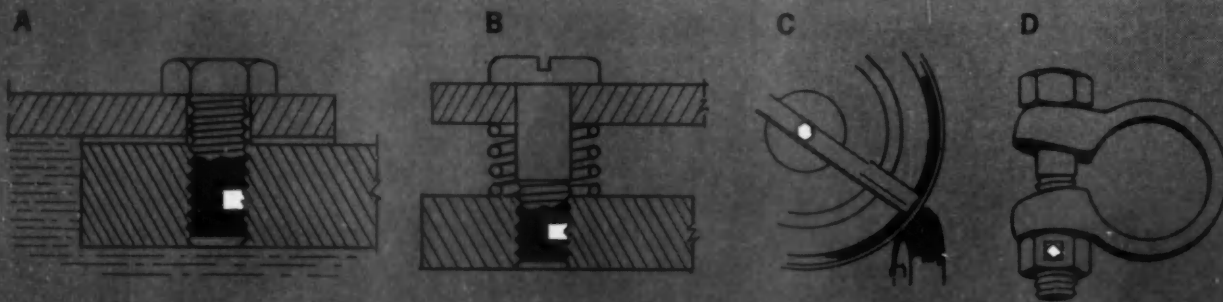
Strong, Modern, Dependable

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is its nylon plug, firmly staked into one of the faces of the cold forged hex nut, or into the body of the bolt. The plug has a plastic memory—or a natural tendency to recover its original shape and "grow" into opposite mating threads. This forces tight metal-to-metal contact for a vibration-proof lock that can't shake loose.



Typical NYLOK applications: (a) NYLOK Bolt as a fastener-sealer to effectively block fluid escape along thread path; (b) NYLOK Bolt used to solve tension or vibration fastening problems; (c) NYLOK Nut used to secure lawnmower rotor blade under severe vibration conditions; (d) NYLOK Nut employed to lock tight against pressure of a spring-clamp.



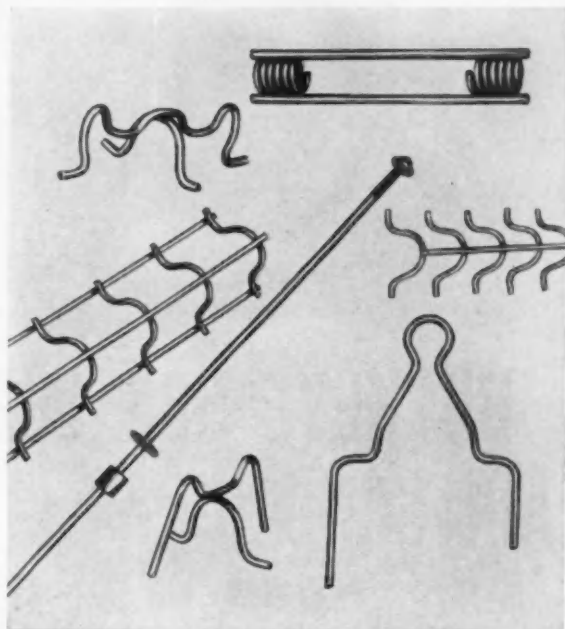


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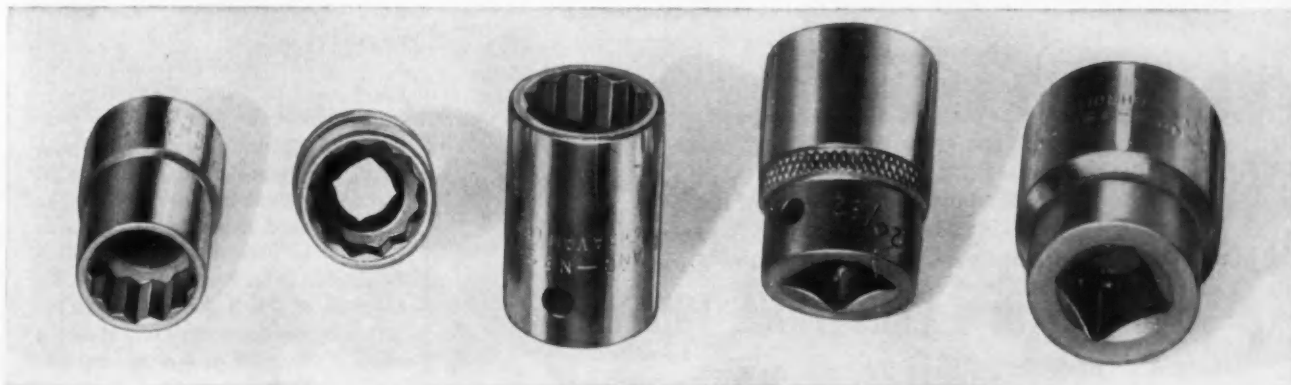
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Using Republic's free metallurgical services, Meadow determined the best wire for each product application, applied cost factors, and now makes more than 20 different parts from relatively few different types of Republic Wire. Result: reduced inventory requirements, lower manufacturing costs. Send for information on Republic Wire and Wire Metallurgical Services.



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## **Construction Industry Trends**

(Continued from page 100)

clutch cut-off that delivers full engine power to the hydraulic system at a touch of the brake pedal, are other features of the machine.

### **A-C Motor Scraper**

Redesign of the Allis-Chalmers TS-160 motor scraper, smallest in the company's all-hydraulic line, will increase the capacity of the unit to 8½ cu yd struck and 11 cu yd heaped, and the payload to 13 tons. It is powered by an Allis-Chalmers 155 hp supercharged Diesel engine. In addition to the low, wide bowl design, the hood and radiator grille have been restyled to bring it into conformity with other units in the company's line.

Double-acting steering jacks and multiplier links, hydraulically operated, give full power steering over the entire steering range. Double-acting lift jacks control the bowl.

The scraper (S-160) is interchangeable with the body of the recently introduced TR-160 rear dump wagon.

### **Foreign Sales Holding Up**

The expected pickup in domestic sales of construction equipment has not yet materialized to any substantial degree, according to officials of manufacturing companies and prominent distributors of equipment. A plus factor that has appeared, however, is the strong continuance of foreign sales, involving both shipments from the United States and shipments from the foreign-based manufacturing facilities of the companies having such facilities. The forecast at the beginning of the year had predicted a rise in the domestic market and a slight falling-off of foreign sales.

Caterpillar Tractor Co. reported sales of \$46,910,606 for January, 1961, as compared with \$54,354,809 for January of 1960. Profits showed a slight upturn, however. Allis-Chalmers reported low operating rates and sales for its construction machinery division last year, due to reduced road building.

Harry O. Bercher, executive vice-





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AUTOMOTIVE INDUSTRIES, May 15, 1961

Circle 155 on Inquiry Card for more data

109

president of International Harvester Co., reporting upon the outlook for construction equipment, stated that sales in the second quarter of the 1961 fiscal year are expected to show a considerable improvement over those of the corresponding period of 1960. The fiscal second quarter began February 1. "I believe the prospect is that our world construction equipment business will finish 1961 at or about the level of 1960. If there should be any pronounced uptrend in the economy

of the United States, sales should exceed 1960 by a modest amount," he said.

### Five New Crenlo Tractor Cabs

Maximum operator protection is provided in a super heavy duty cab designed by Crenlo, Inc., especially for hazardous operations with the Caterpillar 630 four-wheel tractor. It is one of five new cab arrangements developed by Crenlo for this model tractor.

Protective features of Crenlo's Model SC630A include a 3/16-in. steel canopy and structural steel members which are welded to the cab and braced to the tractor frame. Heavy steel guards at the top and rear and a steel grille over the back window further shield the operator. ■

### Executives Meet

Twenty-four automotive executives from 11 European countries met in Detroit last month for a three-day meeting of the Permanent International Bureau of Automobile Manufacturers.

The meeting of the 42-year-old organization was the first ever held in the United States.

Delegates were from Belgium, Czechoslovakia, France, Germany, Italy, The Netherlands, Sweden, Switzerland, United Kingdom, Yugoslavia and Spain.

The new president is Pierre Le-maigre, president of Chambre Syndicale des Constructeurs d'Automobiles, France.

Common market tariff regulations and standardization of European and American automobile specifications were discussed.

### Sees Generator's End

"Eventually, every automobile and truck in the United States will have an alternator to supply electric power to its battery," according to P. H. Neville, president of Leece-Neville Co., Cleveland.

"The DC generator is on its way out," Mr. Neville stated. "One look at the traffic jams last winter will reveal the reason. Most car stalling was a direct result of battery failure, caused by insufficient current supply to the battery from the DC generator. It can not replace the drag on the battery while the car is idling or creeping along at slow speeds."

In addition to alternators available on 1961 models, Mr. Neville said alternators are available as replacements for generators in existing cars with 12-volt ignition systems and will soon be available for six-volt systems.



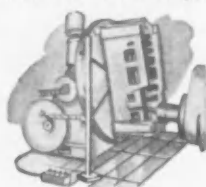
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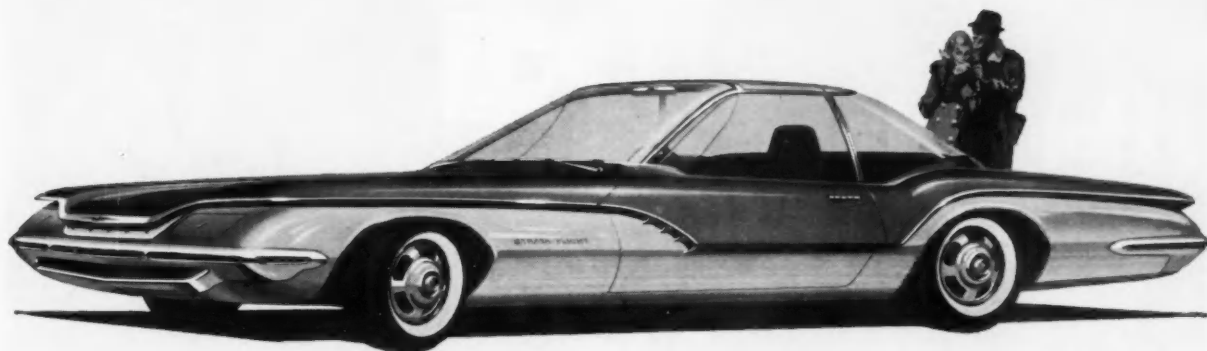
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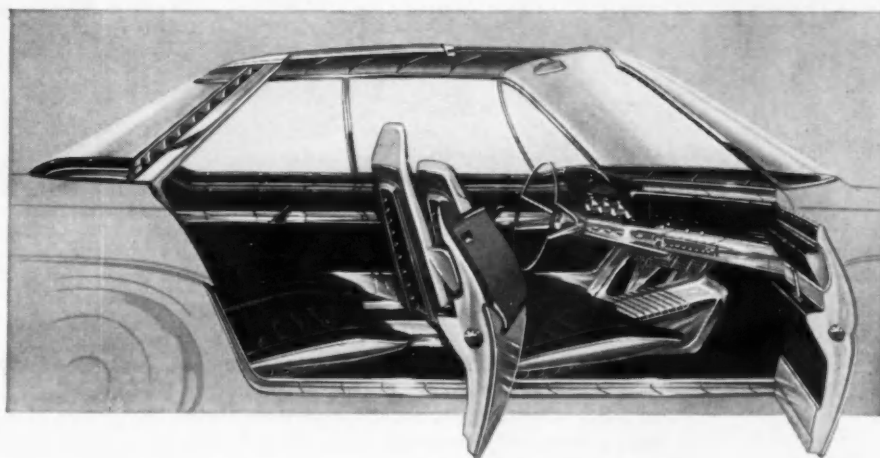
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## DESIGN NOTES

# C/R offers new bonded CRS Seal design in standard sizes — without premium tooling charges



CRS



CRS-A



CRSH



CRSH-A



### Design Advantages

The CRS Seal now provides a new level of C/R Seal performance through its simple, bonded design. There are no internal parts to misalign, no avenues for internal leakage. The shell and sealing member are integral — bonded securely for the long life of the seal. The CRS Seal incorporates a sealing member with both improved lip configuration and improved concentricity. The sealing member has been strengthened over former designs by placing more material at points of major flex and wear — and without increased shaft loading.

### Designer Advantages

The CRS Seal gives the designer one, basic, rugged shaft seal design which may be applied with high reliability to the great majority of common shaft seal applications — particularly in industrial, automotive, farm, and off-the-road equipment.

Four basic design variations are available. As you can see, these provide an auxiliary sealing lip, where it may be required, or provide extra rugged shell construction where conditions suggest the need to protect the seal lip against assembly damage — or where large, heavy-duty shafts are being sealed.

Selection of the new C/R Type CRS Seal gives the designer and buyer major advantages over special seals: shorter lead time on orders, simpler specification, savings in time and money, and improved assembly quality and reliability.

### Operating Maximums\*

Shaft Speeds	3600 fpm (single lip) 2500 fpm (double lip)
Run-out	.016" TIR dynamic eccentricity .010" static eccentricity
Temperature	-30 to +275°F. (225°F. in EP lube)
Pressure	5 psi (single lip) 10 psi (double lip)
Media	Oil, grease, fuel, water

*\*Not all conditions present in one application*

### New, Improved Compound

Standard sealing members for the C/R Type CRS Seal are molded of a new Sirvene synthetic rubber compound having markedly superior sealing and wearing properties. It is a Buna-N-based material with low-friction characteristics. The CRS Seal can also be furnished in the usual special materials such as acrylates, Sili-

cones, and butyls. Shells are of standard steel, but can be provided in corrosion-resistant materials on special order.

### Consult C/R Engineers

For assistance on the application of the new CRS — or on any oil seal problem, get in touch with C/R Oil Seal Engineers. They're specialists in fluid sealing — and will gladly cooperate with you.

### For More Design Data:

You will want the complete design data on the new CRS Seal. Write for our Bulletin CRS-100. It gives you the complete list of standard sizes, widths, O.D.'s, shell thicknesses and sealing lip heights. You will want it to compare and then specify C/R's CRS Seal.

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Brantford, Ontario

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# LEAD

**Youngstown leaded steels  
increase your production,  
prolong tool life**

Adding lead to steel is a Youngstown art, hard to learn. You add the right amount at the right time. Disperse it. Keep the content range correct. Check it, test it, inspect it, control it from the teeming floor to finished hot rolled and cold drawn bars.

Youngstown Yolead and other leaded steels give you better machinability, longer tool life and faster cutting speed. You get more reliable performance, improved ductility. You get lower costs. From small carburetor fittings to big automotive forgings, Youngstown can provide the exact leaded grade that you need, when and where you need it.

Get all these advantages with leaded carbon and alloy steels from Youngstown. Get fast, dependable delivery from your Steel Service Center, and through 28 Youngstown offices. Get quality, get performance, get leaded steel from Youngstown who knows how to make lead behave inside steel.



## **Youngstown — growing force in steel**

For more information about Youngstown leaded steel, write: Dept. 15-B  
The Youngstown Sheet and Tube Company, Youngstown, Ohio



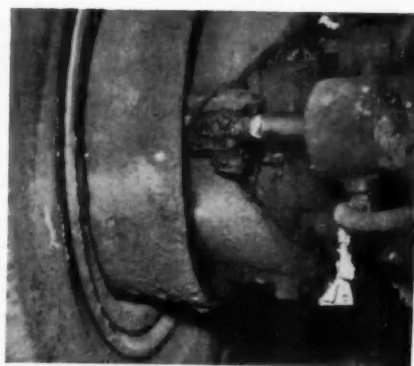
## Hi-Torque brakes make underground hauling safer; hold 44 tons on 20% grades

This shuttle car is one of several KW-Dart vehicles in use at the White Pine Copper Company mine at White Pine, Michigan. The cars are equipped with B.F. Goodrich Hi-Torque brakes, designed for heavyweight off-the-road vehicles.

Each car weighs 44 tons fully loaded with copper ore. White Pine reports the ability of Hi-Torque brakes to handle such heavy loads safely is an outstanding advantage. With full loads, the vehicles hold on steep grades encountered in the mine, ranging up to 20 percent.

The cars are being used on a round-the-clock basis, 7 days a week, with brakes applied most of the time the vehicles are moving. Yet in several months of operation no maintenance or replacements have been required.

You can use these brakes in *your* heavy-duty vehicles with a minimum of design change. Call or write *B.F. Goodrich Aviation Products, a division of The B.F. Goodrich Company, Dept. AI-5, Troy, Ohio.*



Closeup of Hi-Torque brakes on shuttle car wheel. The cars are used over hilly, rocky and muddy terrain.

# **B.F. Goodrich** Hi-Torque brakes





This mark tells you a product is made of modern, dependable Steel.



Mr. William Stark, President, Penn Overall Supply Company, Pittsburgh, Pa.

## Hears speech on "Penicillin" steels . . . buys truck bodies made of Cor-Ten Steel

Here is the story of how one of the largest industrial laundries in the East came to specify USS COR-TEN High-Strength Low-Alloy Steel for its truck bodies.

Mr. William Stark, President of the Penn Overall Supply Company, Pittsburgh, heard an address in Detroit on *Our "Penicillin" Steels\**. The gist of this speech was that these new steels are good for our economic health. It described many of the steels which have been proved in the laboratory and on the job.

One of them, USS COR-TEN Brand Steel, has proved to be the best material yet developed for lightweight, corrosion resisting truck bodies. It withstands shocks, twists and strains of rough service and its surface holds paint considerably longer than carbon steel.

Mr. Stark thought COR-TEN Steel might be just the material for his laundry trucks. He found that he could reduce the weight of his present trucks by about 700 pounds. Operating and maintenance costs would be lower and he could haul more payload!

The Boyertown Auto Body Works, Boyertown, Pa., was already building similar truck bodies of USS COR-TEN Steel that were noted for their ability to take a battering and resist denting throughout their long service life. Penn Overall ordered several of the Boyertown S10H models and Mr. Stark expects them to last considerably longer than his previous units—6 to 7 years instead of 4 to 5.

For more information on USS High Strength Steels, write United States Steel, 525 William Penn Place, Pittsburgh 30, Pa. USS and COR-TEN are registered trademarks

United States Steel Corporation • American Steel & Wire Division • Columbia-Geneva Steel Division • National Tube Division • Tennessee Coal & Iron Division • United States Steel Supply Division • United States Steel Export Company

\*Address made by Mr. Austin J. Paddock, Administrative Vice President—Fabrication & Manufacture, United States Steel, before The Engineering Society of Detroit, May 1960.

 **United States Steel**

# GAS TURBINES

## for Automotive Use

(Continued from page 83)

turbines. These data are significant when compared with the specific fuel consumption noted over the years for the very economical Diesel engine (0.42 to 0.55 sfc).

Acceleration time from idle to

full speed is reported to be reduced by recent Chrysler improvements to less than 1.5 seconds, which produces a vehicle acceleration comparable to an advanced type of reciprocating engine when installed in a passenger car. Similar effort in the same direction is also reported by European manufacturers. The Rover Company of England claims to have been the first automobile manufacturer to operate a car with a gas turbine drive, back in 1950. Two years later the Rover gas turbine car

established a speed record of 152 miles per hour. The latest Rover model for which data are given has a 110 hp turbine operating at 52,000 rpm. It drives a car with a four-wheel-drive and has the engine in the rear. This Rover engine is said to be capable of attaining 60 miles per hour in 10.5 seconds and 80 mph in 17.7 seconds. These figures indicate that acceleration lag need not necessarily be considered an inherent defect of automotive gas turbines today. A comparison of some of the main competitive features of various American automotive gas turbines versus comparable Diesel and gasoline engines is shown in Table II.

## FOR DEPENDABLE *All Weather* COOLING



## Install **EUREKA** RADIATORS

Over 30 years of specialization and engineering research have produced a radiator and core proved dependable under all conditions.

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APPLICATIONS**

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- **GUARANTEED** against defects in materials and workmanship.



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### CURRENT AUTOMOTIVE APPLICATIONS

**P**ASSENGER car development work with gas turbines is currently being actively pursued by many companies and in a number of nations, but it is still a thing of the future. Just when such cars will be commercially available depends on many factors and degrees of enthusiasm. Some say in 1965, others later, and some earlier.

But in trucks and other heavy duty application, both for highway and off-highway use, gas turbines are a development of current importance.

The General Motors Corporation, among others in the automotive industry, has long recognized the value of the turbine engine for specific tasks such as heavy duty hauling. General Motors Research Laboratories has developed a gas turbine, through a series of four experimental model engines, to a point where a practical power plant has been attained.

The first engine in the series, the GT-300, was installed in a 45-passenger highway type bus—the "Turbocruiser"—to find how the turbine would perform in the heavy duty transportation field. The engine was a simple open cycle turbine rated at 320 hp. It was found that although the GT-300 turbine weighed less than half

(Turn to page 122, please)

# What synthetic sealing materials should I use—and when



Environmental conditions generally dictate the type of synthetic rubber for a specific oil sealing application.

Where temperature, shaft speed, runout, eccentricity, and lubricant type are "normal", standard Buna N synthetic rubber compounds are satisfactory. If, however, the application is "dry running", a compound must be selected that will operate satisfactorily with a very small amount of lubricant. If the application involves excessive abrasion, highly "loaded" compound stocks should be provided. At temperatures over 250° F polyacrylics or silicone compounds are indicated; if high temperature is accompanied by a solvent base or additive lubricant, polyacrylics are definitely preferred.

Thus many variables govern successful oil sealing. The chart below gives more data; for complete information from the world's foremost oil seal laboratories, call your National Seal engineer. He's in the Yellow Pages, under Oil Seals or O-Rings.

**SYNTHETIC RUBBER COMPOUNDS**

**RECOMMENDED APPLICATIONS**

Comp. No.	Base Polymer	Min/Max Operating Temperature	Life Index	Price Index	Automatic Transmissions	Pinions	Axle Seals	Engine Seals	Misc. Applications
B-63	Buna N	—40°F/225°F	100	100				Excellent for small gas engines.	Excellent for small non-spring loaded seals.
B-86	Buna N	—30°F/225°F	100	100		Satisfactory for medium temperature applications.	Truck and automotive rear axles. General use.	Satisfactory as general purpose material where temperature permits.	General purpose Buna N applications.
B-94	Buna N	—60°F/250°F	100	100					Excellent against aromatics and some military aircraft oils, fuels.
B-95	Buna N	—30°F/225°F	100	100					Good dry running compounds for applications requiring high durometer stock.
C-6	Buna N	—30°F/225°F	100	100			Excellent for semi-rough axles. Has good wear qualities.		Good for pressure seals due to high durometer and clean trimming.
L-28	Acrylon BA-12	—30°F/300°F	400	125	Good for temperature range indicated.	Satisfactory in single lip construction.	Sealed bearing high temperature applications.	Satisfactory for automotive use. High temperatures.	Satisfactory for high temperature general applications. Can be used with EP or GL-4 oils.
L-34	Hycar PA-21	0°F/300°F	400	115	Good for temperature range indicated.	Dual lip limited contact for high temperatures.	Sealed bearing high temperature applications.	Satisfactory for automotive use. High temperatures.	Satisfactory for high temperature general single or dual lips. Ok with EP or GL-4 oils.
S-48	Silicone*	—80°F/400°F	1500	150	Excellent high and low temperature life.	Silicone Compounds Not Recommended With EP Lubricants at high temperatures.		Excellent for general engine use. Suggested for premium gasoline and Diesel engines.	Excellent wide range material. Avoid use in EP and GL-4 oils.
S-49	Silicone*	—80°F/300°F	600	130	Good at high and low temperatures.			Very good for general engine use; premium gasoline and Diesel engines.	Very good wide range material. Avoid use in EP and GL-4 oils.

\*Silicones require special stabilization for satisfactory use in aromatic oils at high temperatures.



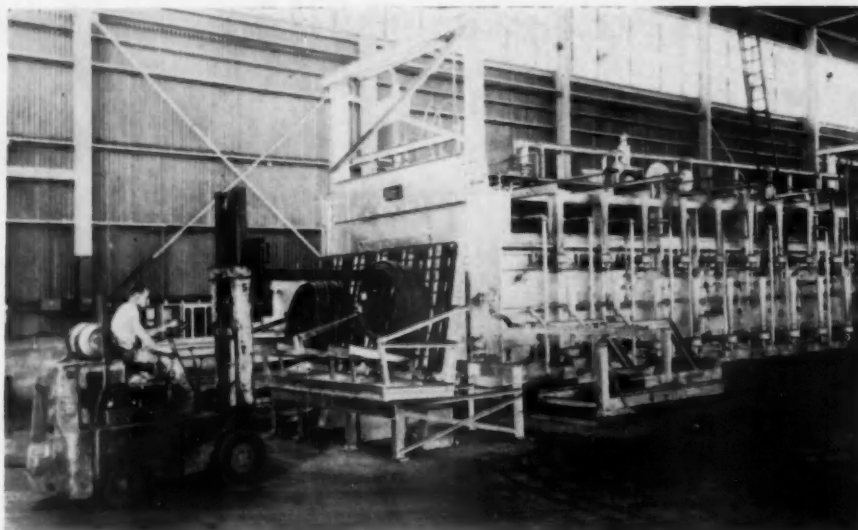
## NATIONAL SEAL

Division, Federal-Mogul-Bower Bearings, Inc.

GENERAL OFFICES: Redwood City, California

PLANTS: Van Wert, Ohio; Redwood City and Downey, California

Operator loads two trays with coil stock prior to pushing them into the vestibule of the Surface Combustion continuous pusher-type furnace. Before the trays go into the vestibule they are placed in a horizontal plane at hearth level.



**By John Tschopp**  
**Chief Metallurgist**  
**The Chicago Screw Co.**

## Spheroidizing of Heading Stock

**T**HE Chicago Screw Co., Division of Standard Screw Co., Bellwood, Ill., recently put into operation a new 102 ft long, continuous pusher-type furnace for spheroidizing coiled rod stock used for cold-headed fasteners.

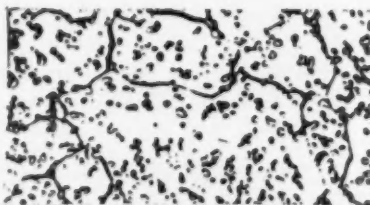
The furnace, built by Surface Combustion Corp., and heated by suction type radiant tubes, is designed for flexible operation. Gas-tight in construction, it can be used for annealing on a number of heating and cooling cycles, with or without protective or re-active atmospheres. The furnace can also be used for carbonitriding, carburizing, carbon recovery and normalizing.

### Application

At the present time, the unit is specifically used for spheroidizing the coil stock. It consistently produces better than 85 per cent spheroidization of pearlite in the structure of SAE 1038, 1041 and several low alloy steels. Operating on precise cycles, it is processing tons of spheroidized coil during each eight-hour shift.

One operator, with a lift truck, operates the furnace and handles the coils in and out of storage. The

coils are placed on a heat-resisting cast 35-15 alloy tray which, in turn, has been placed on a tilting mechanism at the loading vestibule. The 15 ft wide furnace takes two such tray loads of coils placed across its width. The trays are advanced through the furnace and discharged by automatic mechanisms actuated hydraulically. The operator, using the lift truck, re-



(Upper) Typical as-rolled structure of 4140 steel as received from mill.  
 (Lower) Typical spheroidized structure of 4140 steel after fast spheroidize anneal in the furnace at 1300 F.

moves and places the coils with the finished stock, ready for pickling.

### Quality Improved

Chicago Screw has gained several quality and cost advantages in its headed products since this new furnace has been placed in operation. It now has more complete control of product. Also, continuous operation has added to better and more simplified quality control. Experience in the operation of the furnace has shown that structures and hardness can be dependably reproduced by duplicating previously used cycles and temperatures.

Utilization of Surface suction type, radiant tubes in the furnace not only provides fast uniform heating, but also keeps scale build-up at a minimum. This, in turn, permits faster pickling and cuts product weight loss.

Installation of the new annealing furnace at Chicago Screw has given the fastener industry one of its first continuous coil annealing setups. ■

### Grumman Contract

Grumman Aircraft Engineering Corp. has been awarded a \$38 million contract for additional W2F-1 Hawkeye planes. Previous contracts totaled more than \$140 million.

The Hawkeye is a carrier-based early warning and interceptor plane. It carries a crew of five.



# SILICOLOGY

## Studies in Silicones

HOW THESE TIME-TESTED MATERIALS  
CAN WORK FOR YOU

### For Shear Reliability— Design with Silicone Fluids

Some of the most astonishing things that hydraulic systems are doing today are being done by and because of silicone fluids. In automotive applications, for one, they're the lifeblood of certain long-lasting hydraulic transmissions, power steering, speed-and-temperature-regulated fans. In aviation and other fields, you'll find them in sensitive gyroscopes, damping devices, liquid springs, valve lifters.

#### MANY USEFUL PROPERTIES

Of course, designing such systems requires knowledge of silicone fluid behavior. Knowledge of viscosity-temperature properties, oxidative and thermal stability, lubricity, thermal expansion, effect on rubber seals of all kinds, compressibility, and apparent viscosity vs. shear rate.

This last is particularly important. And the well-defined shear-viscosity curve of UNION CARBIDE Silicone Fluids, combined with their unique temperature stability (remember that shearing raises fluid temperature), makes them among the most dependable of hydraulic fluids.

You may have heard or discovered for yourself that silicone fluids make elastomeric seals shrink, and may even have dismissed them from your consideration, much as you would like to take advantage of their other properties. Then here is news:

#### EFFECT ON RUBBER SEALS

UNION CARBIDE has conducted extensive studies of the effect of silicones on various elastomers, and has shown how this problem can be easily met by the use of proper additives in the fluids. In the accompanying table you can see, for example, how "Plexol" 201 additive (Rohm & Haas) in silicones affects the per cent volume change of Neoprene W rubber. Similar data covers per cent weight change, compression set, hardness, etc. Moreover, these data are available on many other natural and synthetic rubber compounds.

How can you get them? They're available now, along with much other important information including more detailed shear-viscosity curves. Just mail the coupon for our latest "Design File" on

UNION CARBIDE Silicone Fluids for Mechanical Applications. It provides in one handy package just about everything you need to know about silicone fluids for your projects.

Effect of Silicone Oil  
on Neoprene W Rubber

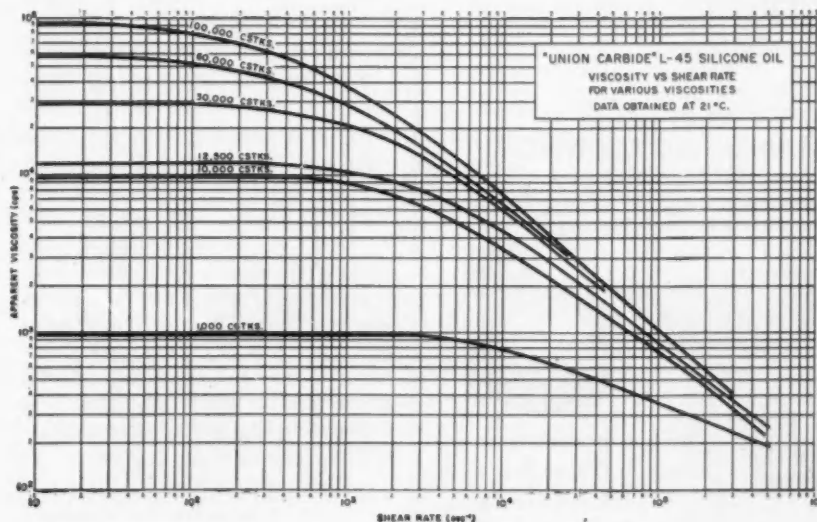
Immersion Fluid	% Volume Change	
	7 days 70°C.	4 days 100°C.
10° L-45	-0.51	-0.15
100° L-45	-0.47	-0.55
1000° L-45	-0.58	-0.69
1000° L-45 + 2.5% "Plexol" 201	4.47	3.75
1000° L-45 + 7.5% "Plexol" 201	17.02	18.60
L-527	8.34	10.66
Water	9.73	15.75

\*centistokes

**UNION  
CARBIDE**

## SILICONES

UNION CARBIDE is a registered trade mark  
of Union Carbide Corporation.



Silicones Division  
Union Carbide Corporation  
Dept. BE-0103  
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In Canada: Union Carbide Canada Ltd.,  
Bakelite Division, Toronto 12.

Please send me free copy of Design File  
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Mechanical Applications.

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If you use gears in the product you make, we believe it will pay you, as it has others, to become acquainted with FAIRFIELD — the place where fine gears are produced to meet your specifications EFFICIENTLY, ECONOMICALLY! Check with Fairfield NOW on your gear requirements. Call or write.

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## GAS TURBINES

(Continued from page 118)

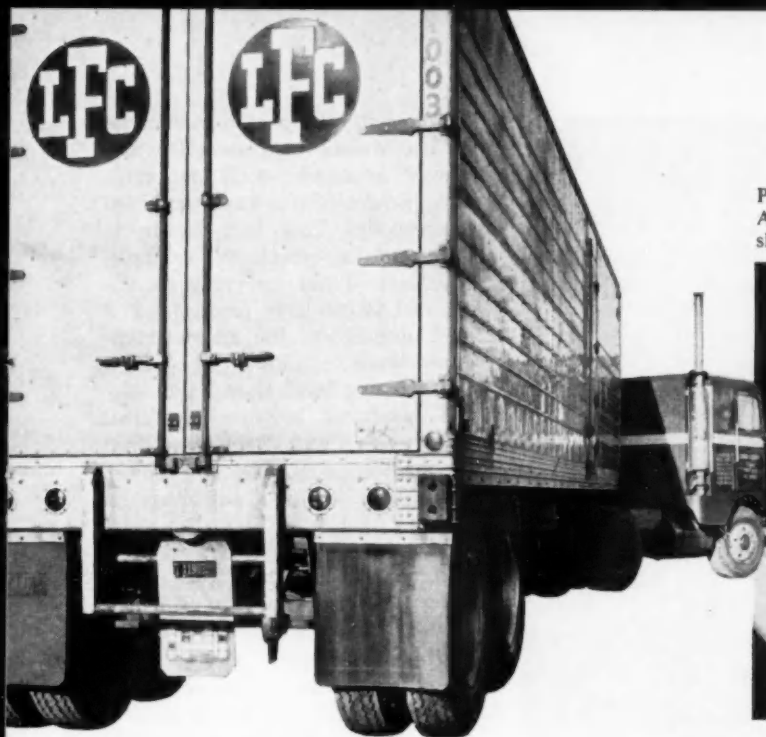
as much as the Diesel it replaced, it produced almost double the horsepower. The Turbocruiser accelerated at mid-speed range as well as most passenger cars and climbed steep grades at full load better than an empty standard bus. However, the tests also turned up several shortcomings, the most undesirable being high fuel consumption and a high exhaust heat and noise level.

The GT-300 was followed closely by the GT-302, another simple cycle gas turbine engine. This Firebird I was developed to test the performance of the gas turbine in an automobile. It had a 370 hp engine coupled to a two - speed transmission. While the power plant delivered generally high performance, it had the same drawbacks as the GT-300 plus a rather sluggish throttle response at idle.

Then, in 1955, GM introduced the Firebird II with changes designed to correct the shortcomings of the earlier models. The Firebird II was a four-passenger automobile powered by a Model GT-304, 200 hp, regenerative gas turbine engine. Regeneration, which means recovery of the exhaust heat, solved a number of the problems encountered in previous models. By salvaging the waste exhaust heat, the exhaust temperature and noise were lowered to acceptable levels. Fuel consumption was also reduced, by as much as 50 per cent.

The turbine engine was now ready to be tested in a heavy duty vehicle on a competitive basis with piston engines. GM installed the GT-304 in a Chevrolet truck-tractor which was called the Turbo-Titan. Incorporating a tandem rear axle, six-speed automatic transmission, and a three - speed transfer box, the truck had been powered by a 322 cubic inch overhead valve V-8 gasoline engine rated at 195 gross hp. This was replaced by the 200 hp regenerative GT-304 gas turbine engine.

The most significant change as a result of replacing the standard



Poured-in-place Glidfoam fills all voids, leaves no air leaks. And Glidfoam bonds rigidly to trailer walls, preventing shakedown, adding structural strength.



## How Glidfoam\* insulation helped this reefer haul 21% more payload for 250,000 below-zero-miles

Cargo space was increased 300 cubic feet with Glidfoam poured-in-place polyurethane foam, installed in this Lipsman-Fulkerson Company reefer two years ago by the Sterling Refrigeration and Engineering Company.

The high thermal efficiency of Glidfoam provided below-zero insulation with only three inches of wall thickness, compared to the usual six inches. This increased average payload by 6000 pounds.

Additional benefits gained from Glidfoam insulation were low moisture pickup (100 pounds in twelve months compared to the usual 1000 pound pickup), complete elimination of insulation maintenance costs and greatly reduced fuel costs in operating the refrigeration unit.

For high efficiency insulation for your reefers, specify poured-in-place Glidfoam. Glidden supplies the complete two-component system. Write now for specifications.



**THE GLIDDEN COMPANY**  
INDUSTRIAL PAINT DIVISION  
900 Union Commerce Building  
Cleveland 14, Ohio

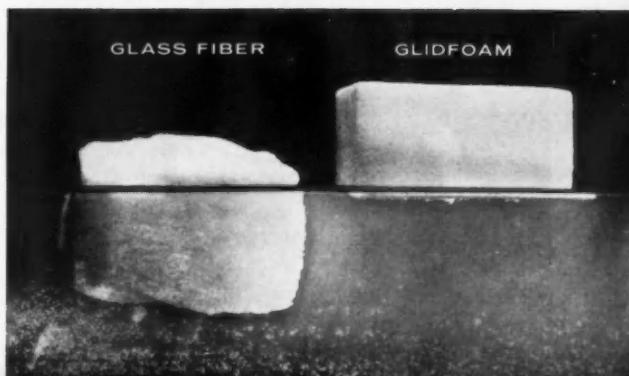
\*Glidfoam is the trade name of Glidden polyurethane foam, registered trademark applied for.

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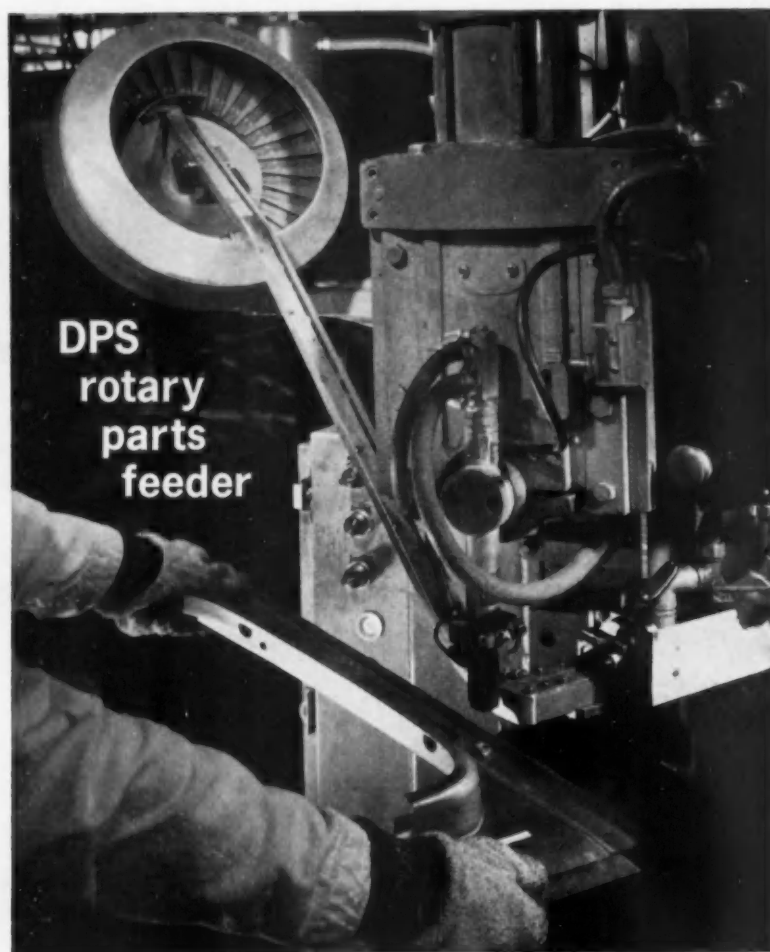


You can carry more cargo with Glidfoam-insulated reefers. Walls can be thinner, increasing cargo space as much as 500 cubic feet in a 40-foot trailer.

Flotation test proves Glidfoam's low water absorption. Glass fiber insulation soaks up water and sinks. Glidfoam stays high and dry. This means no maintenance, long-term insulating efficiency, no increase of dead weight with Glidfoam.







**DPS  
rotary  
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## doubles nut welding output in sub-assembly production line

In this sub-assembly operation, production of the welding equipment was limited because the weld nuts had to be hand positioned. When the DPS rotary parts feeder took over the feeding operation, nut welder output was doubled.

Savings and efficiencies such as this are being effected in assembly operations throughout industry. Parts of a variety of sizes, shapes and materials are successfully being handled in DPS rotary, vibratory and elevating type parts feeders . . . industry's most complete line. Parts ranging from common bolts, nuts and screws to the many more unusual pieces that are used in the complex machinery of today.

DPS engineers welcome the opportunity to work with your engineers in analyzing assembly problems and production line procedures. They will recommend the one best feeder to effect lower manufacturing costs and improved product quality. Write or call today. Ask for free catalog.



**DETROIT POWER SCREWDRIVER CO.**

*A Subsidiary of Link-Belt Company*

Selective Parts Feeders; Screw, Nut and  
Stud Driving Machines;  
Special Purpose Assembly Machines

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Detroit 16, Michigan  
TAshmo 5-3070

engine with the gas turbine came in performance. Acceleration improved as much as 27 per cent, and gradeability was increased appreciably. This last factor is extremely important. For example, the Turbo-Titan, carrying an additional 10,000 lb of payload, could still outperform the standard engine truck on hills. This high performance level, though partially the result of increased installed horsepower, was largely realized because more usable horsepower was available. This advantage is a direct result of the torque characteristics of the dual shaft gas turbine engine. The torque characteristic results in a broad horsepower curve which allows the engine to operate over a wide range of speeds with a minimum loss of power. The piston engine, with its narrow horsepower curve, has difficulty retaining peak horsepower and delivering its rated power capacity. This is especially true on hills. According to GM engineers, these tests proved that a turbine engine will deliver more usable horsepower over a given speed range than a reciprocating engine for the same installed horsepower.

Tests run on the Turbo-Titan in 1957 illustrate some interesting factors in the potential fuel economy of the turbine engine. In order to make a valid comparison with a production truck, the gross load of the Turbo-Titan was increased by 15,000 lb to maintain more nearly equivalent performance. The comparison was made on the basis of ton miles per dollar of fuel cost. The gas turbine truck operated on fuel costing an average of three cents per gallon less than the standard production truck. Furthermore, the multi-fuel feature of the gas turbine allows the operator to choose the cheapest compatible fuel available.

GM researchers point out that when gauging fuel economy, the true criterion must be the overall fuel cost balanced against revenue derived. In other words, the additional payload that can be handled by a turbine engine may make the overall operating costs lower even though the fuel costs may  
(Turn to page 130, please)



**Precisely swaged** to hug the rigid curves of a starter solenoid housing, this insulating spacer is fabricated by CDF from  $\frac{1}{8}$ " sheets in one high speed strip operation. No other machining is required. Vulcanized fibre is used because of its electrical insulating properties and its ability to withstand high torque load.

**Result:** Mass fabrication of a difficult shape to close tolerance at low cost . . . again from CDF!



**CONTINENTAL-DIAMOND FIBRE**

CONTINENTAL-DIAMOND FIBRE CORPORATION, NEWARK, DELAWARE • A SUBSIDIARY OF THE **Budd** COMPANY

AUTOMOTIVE INDUSTRIES, May 15, 1961

# NOW....

the most paintable-durable-weldable  
zinc-coated steel yet produced

# ....NEW ARMCO

Spangle-free Armco ZINCGRIP® A, PAINTGRIP® is a zinc-coated steel specially prepared to take an ultra-smooth, lasting paint finish.

You can paint its spangle-free surface right after fabrication. Three years of outdoor tests show paint adherence and paint life on ZINCGRIP A, PAINTGRIP superior to phosphate-treated cold-rolled steel and to all other zinc-coated steels prepared for painting. And its hot-dip zinc coating keeps rust away when paint is damaged—protects from corrosion where there's no paint at all.

## WELD IT

Tests with production equipment show *two times as many spot welds* can be made on ZINCGRIP A, PAINTGRIP as on ordinary galvanized steel before electrode tips need redressing. It's every bit as workable as Armco ZINCGRIP—the original hot-dip, zinc-coated steel, proved in severely fabricated products for more than a quarter-century.

New Armco ZINCGRIP A, PAINTGRIP is available now in gages from 16 to 24 and with 1.25 ounces per sq. ft. class coating or light commercial coating in cut lengths and coils up to 48 inches wide, depending on gage. Mail coupon for details.



Armco Division

### ARMCO DIVISION

Armco Steel Corporation  
1881 Curtis Street, Middletown, Ohio

PLEASE SEND more data on new ZINCGRIP A, PAINTGRIP

NAME \_\_\_\_\_ TITLE \_\_\_\_\_

FIRM \_\_\_\_\_

STREET \_\_\_\_\_

CITY \_\_\_\_\_ ZONE \_\_\_\_\_ STATE \_\_\_\_\_



New steels are  
born at  
Armco

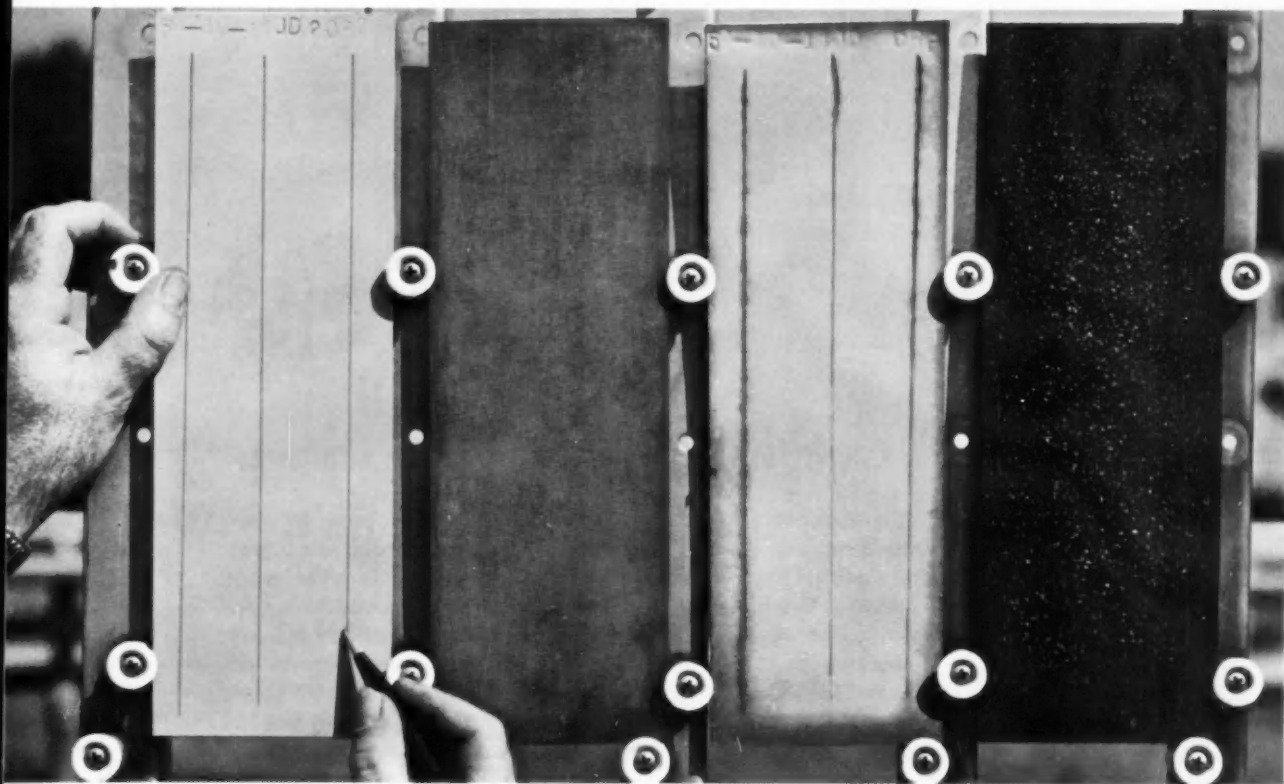
## ZINGGRIP A, PAINTGRIP

1

2

3

4

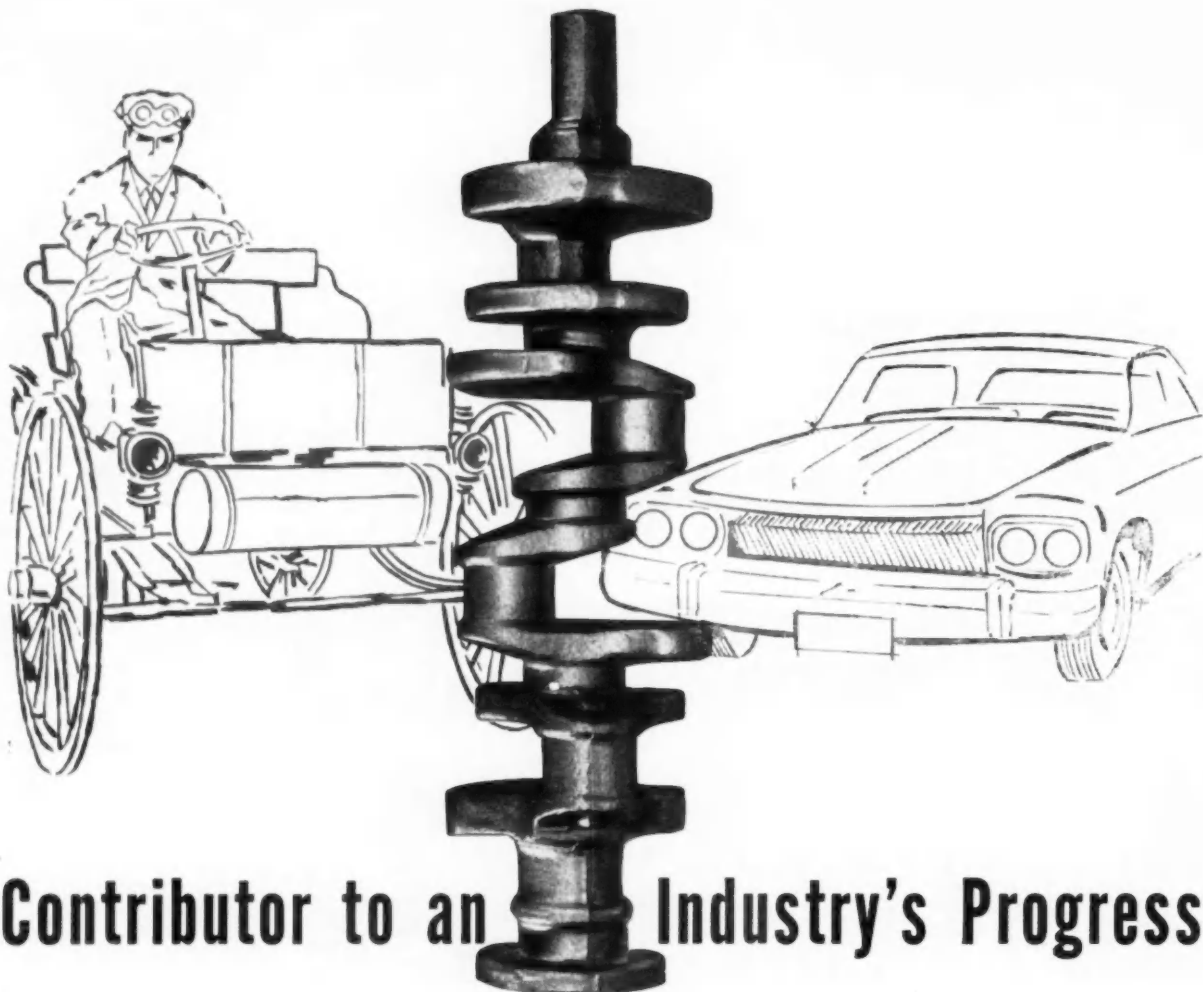


◀ This half-painted bus body fabricated from Armco ZINGGRIP A, PAINTGRIP has been exposed for 2½ years. Paint finish is still smooth and attractive, the unpainted surface rust-free.

▲ After 3 years' exposure outdoors, paint holds tightly to sample (Number 1)—Armco ZINGGRIP A, PAINTGRIP—even in areas scratched at the start of the test. Unpainted ZINGGRIP A, PAINTGRIP (sample 2) also shows no rust. In contrast, the painted and unpainted phosphate-treated cold-rolled steel test panels (3 and 4) are in poor condition. Paint has been undercut. Rust is entrenched.



Use this label  
to indicate durable  
zinc-coated steels  
in your products



## Contributor to an Industry's Progress

### Wyman-Gordon crankshaft forgings meet every design challenge

From horseless carriages of yesteryear to the sleek cruisers and lithe compacts of today, thousands of engine designs have come off the industry's drawing boards. Each has posed new problems, new challenges to the crankshaft producer as the stresses generated by the demand for higher power and efficiency continue. Through the years Wyman-Gordon contributions to

power-plant progress have been decisive. Advances in forging techniques, metallurgy and control of flow patterns have made Wyman-Gordon forged crankshafts the acknowledged standards of reliability in every era. But progress never stops—for new engine developments, still in the design stage, will benefit as much from Wyman-Gordon know-how as have those of past decades.

**FORGED**



EST. 1883

# WYMAN - GORDON

## FORGINGS

*of Aluminum Magnesium Steel Titanium . . . and Beryllium Molybdenum Columbium and other uncommon materials*

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WORCESTER MASSACHUSETTS

DETROIT MICHIGAN

GRAFTON MASSACHUSETTS

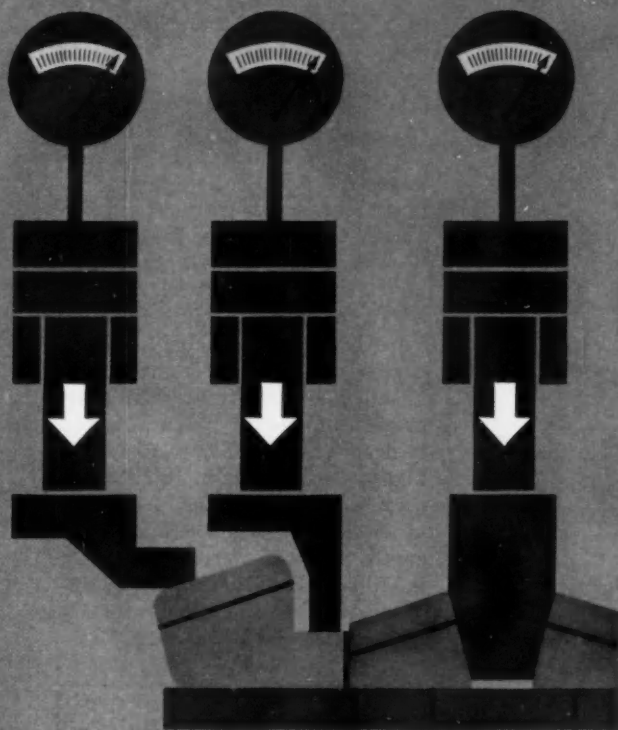
LOS ANGELES CALIFORNIA

PALO ALTO CALIFORNIA

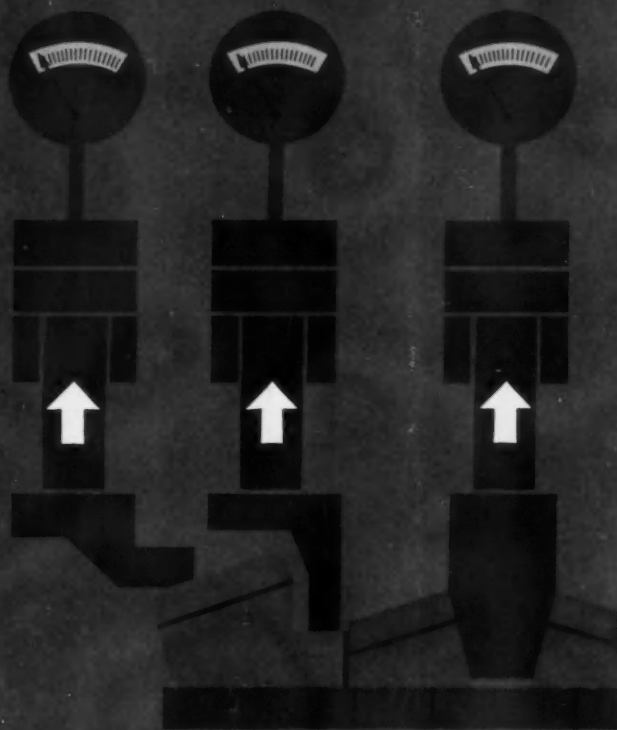
FORT WORTH TEXAS



## PULSING PRESSURE ON



## PULSING PRESSURE OFF



# New Quenching Machine pulsates to eliminate distortion

The pulsing feature of the No. 529 Quenching Machine allows the use of high pressures to control distortion of parts under quench. Pulsing, which is a way of alternately applying and releasing pressure on the part, allows for the natural contraction of the part . . . and eliminates stresses in the part-die relationship.

You get tremendous latitude in control of the quench, since as much as 200 gallons of oil can be pumped over the parts.

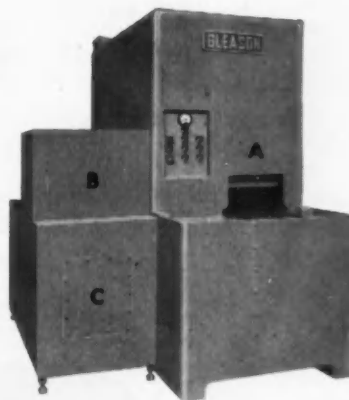
Simply preset the oil flow with valves and timers, and you have the following automatic cycle: start with a fast quench

to set the part, switch to a lower rate; then finish with a rapid quench or vary the sequence any way you wish.

The hydraulic system has a maximum of 1000 pounds of pressure per square inch; a combined total of 50,000 pounds of pressure is available on this machine.

You can handle parts up to 10½ inches in diameter and 4 inches high in the No. 529 Quenching Machine. And it is available in three variations; by adding units as shown in the caption, production is greatly increased.

Drop us a card, and we'll send you more data on specifications and operation.



The basic No. 529 Quencher (A) is manually loaded and unloaded. Automatic unloading (B) is easily added. An auxiliary quench chamber (C) can be added for high production work.



## GLEASON WORKS

1000 UNIVERSITY AVE., ROCHESTER 3, N. Y.

Circle 171 on Inquiry Card for more data

To get the most out of barrel finishing

# ask Oakite

OVER 50 YEARS CLEANING EXPERIENCE • OVER 250 SERVICE MEN • OVER 160 MATERIALS



## Barrel finishing cuts unit-cost of deburring from 15¢ to 1¢! How much could it save you?

In one midwest plant, total cost of deburring 20,000 complex aircraft parts by barrel method came to less than \$200. This compares with a former cost of \$3,000 by hand methods.

This startling reduction in cost is the result of handling hundreds of pieces at a time, instead of grinding each one separately . . . and the result, too, of using the right compound to help the media and barrel do their work.

It's in selecting and supplying the right compound that Oakite helps you get the most out of barrel finishing. Oakite compounds include alkaline and acidic types . . . for steel, brass, zinc die castings, aluminum or alloy parts.

Ask your local Oakite man about barrel finishing, or write for free booklet on barrel finishing to Oakite Products, Inc., 28A Rector Street, New York 6, N. Y.

*it PAYS to ask Oakite*



## GAS TURBINES

(Continued from page 124)

be higher. Oil consumption is extremely low because the oil does not come in contact with combustion products or unburned fuel. In general, all tests run on the Turbo-Titan indicated that the gas turbine compared favorably with the piston engine with respect to durability, economy and reliability.

Next in the series of automotive turbines came the GT-305, a completely new engine with improvements in fuel economy and dependability. GT-305 engines were installed in the Firebird III automobile, a military track-laying vehicle, and a second Chevrolet highway truck-tractor. In 1959, the responsibility for the continued commercial development of this engine was transferred by GM to its Allison Division. The engine designation was changed from GT-305 to GMT-305.

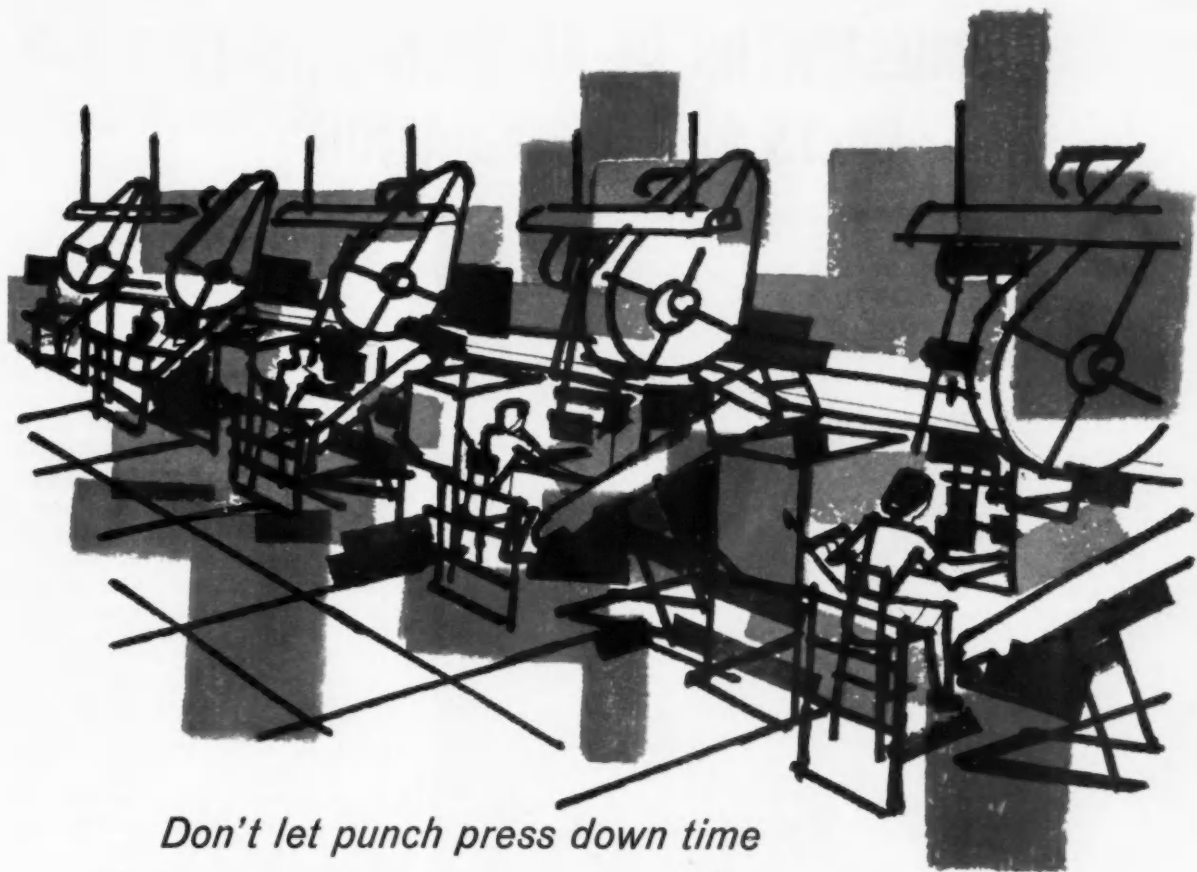
### CONSTRUCTION MATERIALS

**I**NTERNATIONAL Nickel — which has undertaken the field testing of this revolutionary engine—has long been interested in the potentials of the gas turbine for commercial use. In fact, Inco research helped develop the heat-resistant nickel alloys which made possible the use of gas turbine engines in turboprop and turbojet aircraft.

Approximately 30 lb of nickel in alloyed form are used in this prototype engine. The highest percentage of nickel-containing materials is utilized in the hot end components such as the turbine blades, turbine wheels, combustion chambers and nozzle vanes. The drum-type regenerator, which operates at a lower temperature, also relies heavily on nickel-containing alloys.

In the gasifier turbine and power turbine rotor assemblies, GMR-235, a cast, age-hardenable, nickel-base alloy, is used for blades. An iron-

(Turn to page 133, please)



*Don't let punch press down time  
cost you production and profit!*

## Install **ALEMITE CENTRALIZED LUBRICATION**

Only Alemite has all four Centralized Lubrication Systems...one of them is just right for your punch press or machine needs:



**ACCUMITE**—small, easily installed system gives positive measured shot of oil or light grease to each bearing.

**ACCUMATIC I**—simple, single line system for oil or medium weight grease. Wide range of valve capacities.

**ACCUMATIC II**—twin line system can easily handle every heavy grease that can be pumped.

**ALEMITE OIL-MIST**—delivers air-borne oil mist to every bearing to lubricate, cool, shut out dirt and grit.

When a punch press has to "knock off" to be lubricated, expensive man and production hours are lost all the way down the assembly line. Not so with an Alemite Centralized Lubrication System! All points that need lubrication get it—*automatically and economically*. Production never stops. Machine life is extended. Breakdowns and excessive wear are minimized. Centralized systems get the most out of lubricant used, keeps it clean since it is applied, through tubing, in measured amounts to prevent waste and product contamination.

*For complete details on one or all four systems, write today!*

In Canada: Stewart-Warner Corporation of Canada, Ltd., Belleville, Ontario



Dept. M-51, 1850 Diversey Parkway, Chicago 14, Illinois

# 75-MILLIONTHS OF AN INCH BARRIER HALTS METAL MIGRATION



**JUST BENEATH THE FRESH OVER-PLATE OF THESE F-M ENGINE BEARINGS (LEFT) LIES A TENUOUS DIFFUSION BARRIER.** Though this film of metal is only 75-millionths of an inch thin, it stops tin in the overplate from migrating into the lining metal beneath. Its presence is important to bearing overplate performance, particularly during the critical period of engine break-in. Maintaining uniform thickness as well as uniform composition of the plated barrier is most important . . . and most difficult to achieve on a production scale. Federal-Mogul research has developed a unique, extraordinarily precise method for controlling both the thickness and the metallic composition of this barrier, within narrow limits. And the performance of F-M engine sleeve bearings attests to the success of the method!

**RESEARCH INTO ELECTROPLATING** problems is a continuing project in the F-M laboratories. Unusual precision equipment and facilities are employed, many of which have been specially designed and engineered by F-M to solve problems of sliding-bearing application. As a result, Federal-Mogul engineered sleeve bearings, precision thrust washers, formed bushings, and low-cost spacers provide the finest possible performance characteristics for any application.



Have you a problem with bearings, bushings or washers? Are you considering the development or redesign of an item of the type shown above? We'll be glad to show you how the job can be done most effectively and economically. For information, write Federal-Mogul Division, Federal-Mogul-Bower Bearings, Inc., 11037 Shoemaker, Detroit 13, Michigan.

## FEDERAL-MOGUL

sleeve bearings  
bushings-spacers  
thrust washers

DIVISION OF  
FEDERAL-MOGUL-BOWER  
BEARINGS, INC.



# GAS TURBINES

(Continued from page 130)

base (16-26-6) chromium, nickel, molybdenum alloy is used for the wheels. A.I.S.I. 4340, a nickel, chromium, molybdenum high strength heat-treated steel, is used for the shafts. Turbine bolts for high temperature use are made of Inconel "X" \*\* and age-hardenable nickel-chromium alloy.

Castings of SAE 60347, a stainless steel alloy of 10.5 per cent nickel and 18 per cent chromium, are used in the transition liner support, turbine casing, engine bulkhead and extensions, and the nozzle support and casing.

Hastelloy X \*\*\* nickel-base sheet alloy which retains high strength at high temperatures, is employed in the combustion chambers and transition liners. The crossover tube is made from SAE 30347, a wrought stainless steel alloy containing 11 per cent nickel.

In addition to the gas turbine purchased by Inco, the Allison division of General Motors is presently manufacturing prototype GMT-305 engines for use in a highway tractor, a 28-ft personnel boat, an amphibious lighter, a military track laying vehicle, an earth-moving tractor, and other applications.

The Industrial Products Division of the Boeing Airplane Company has been active in gas turbine research, development and production for the past 17 years. According to a recent statement by this Company, "Early Boeing Turbine applications included the world's first turbine - powered highway freight truck and earth - moving tractor. Most recently a 325 shaft horsepower model of the Boeing turbine has been used for large fire trucks, which notably require high reliability and excellent starting characteristics. Boeing pioneered the two-shaft simple cycle single-stage turbine, believing that the low initial cost, low maintenance and low weight of this type

\*\* Trade Mark, The International Nickel Company, Inc.

\*\*\* Trade Mark, Haynes Stellite Company

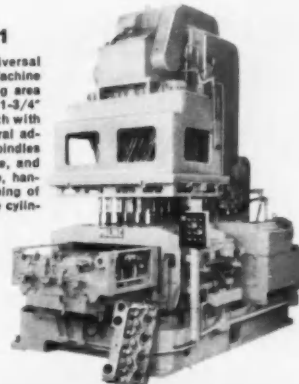


**HD13**

straight line drilling machine with hydraulic table feed and 18 spindles each having 11/16" diameter drill capacity in mild steel. Spindle center distances are adjustable along the 6-foot machine rail.

**MODEL HU111**

Hydraulic Feed, Universal Joint-Type Drilling Machine with 24" x 30" drilling area and with forty-two 1-3/4" spindle drivers, each with two-speed and neutral adjustment. Thirty-six spindles in slip spindle plate, and power shifting fixture, handle drilling and reaming of three different engine cylinder heads.



## MOLINE Cost Reducing Equipment

**MODEL MR148**

Three-way, three-spindle, horizontal boring machine with selective automatic feed cycle. Handles boring of cylinder and crank bore for 3 sizes of 1-cylinder blocks. Also bores for wet sleeves in 2- and 3-cylinder blocks.

60 years of Machine Tool Engineering Experience is at your service for

- Multi-Spindle Boring • Single and Multi-Spindle Honing
- Straight Line Multi-Drilling • Adjustable Spindle Drilling
- Special Multiple Operation Machine Tools

Write for Details



**MOLINE TOOL COMPANY**

100 20TH STREET • MOLINE, ILLINOIS

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REPRESENTATIVES IN PRINCIPAL CITIES

### The Right Rubber Part TO FIT YOUR PRODUCT

Must be: 1. Custom made. 2. The product of a carefully designed die or mold. 3. Developed from properly compounded rubber stocks. 4. Backed by ability and experience gained through a wide variety of industrial applications.

Western serves such diverse industries as communications, electronics, transportation, farming, plumbing, heating, chemistry and pharmaceuticals.

Why not let Western's proven success in these and allied fields help to produce the rubber part you need.

Write or phone for information, literature or a visit by our sales engineer in your area.

**WESTERN RUBBER CO.**  
GOSHEN 8, INDIANA

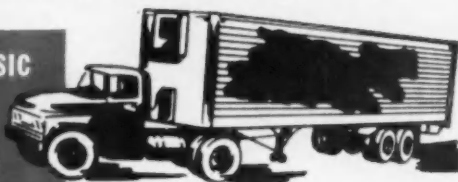
SINCE 1902

MOLDED AND LATHE-CUT RUBBER PARTS FOR ALL INDUSTRIES

# TRUCKERS ARE REPLACING ORIGINAL EQUIPMENT ENGINES WITH THE "PRECISE POWER" OF CONTINENTAL RED SEALS



**A BROAD RANGE OF BASIC  
ENGINE MODELS  
GASOLINE-DIESEL-LPG  
26 TO 300 HORSEPOWER**



The unmatched breadth and diversification of the Continental line of Red Seal transportation engines assures **PRECISE** power for heavy-duty highway trucks and tractors, both as original equipment and as replacements for other makes, in buses, taxicabs, door-to-door delivery vehicles, transport mixers and the like.

6 East 45th St., New York 17, New York  
6218 Cedar Springs Road, Dallas 9, Texas  
3402 Century Boulevard, Inglewood, Calif.  
1252 Oakleigh Dr., East Point (Atlanta) Ga.

**Continental Motors  
Corporation**  
MUSKEGON, MICHIGAN

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## PRESENT PROSPECTS

SOME authorities have optimistically stated that an annual \$5 billion market awaits full development of the gas turbine in the automotive field. They differ in predicting just when this will be achieved. But experience in the railroad, marine, industrial and aviation fields indicate that the gas turbine is an inherently durable and reliable machine with excellent prospects for automotive use. For trucks and passenger cars, the ability to burn a wide variety of low-cost fuels, to deliver a high torque without complex transmissions, to save on size and weight, and to operate for prolonged periods without requiring service, are formidable advantages. In addition, the combustion efficiency of a gas turbine is extremely high (95 to 98 per cent); consequently pollution of the atmosphere would be definitely reduced through the wide-spread use of such engines.

Some of the theoretical disadvantages that were first anticipated by a few engineers have turned out to be minor matters. Thus the early problems of engine noise, difficulties with engine-compartment heat and ventilation, and with the high speed of rotation and engine controls, have gradually faded from the scene. The widely-held current view is that the gas turbine is or can be a source of extremely smooth power application, economical in both fuel and oil consumption, able to give excellent performance, and with a favorable weight-to-power ratio. The cost of durable construction materials cannot be considered a serious drawback, if experience with existing gas turbines in other

# AIRETOOL NEW IMPACT WRENCH

**SPEEDS FASTENING  
OPERATIONS**



Now . . . a fast-acting, air-powered impact wrench that *steps up* assembly fastening and *stands up* under three-shift operations. Heat-treated aluminum housing, rugged design and unitized construction make maintenance and handling easy; hand-fitted pistol grip, trigger action and minimum torque cuts operator fatigue; high run-down speed, low air consumption, self-lubricator and air strainer increase

efficiency and service life; no springs or centrifugal force required for operation; available in two reversible models with bolt capacity of 1/2 inch. Model 625 with 1/2" drive square, 626 with 3/4" square. For details and in-plant demonstration of this or any of Airetool's complete line of pneumatic nutsetters, screwdrivers, grinders, drills, etc., call your nearest representative . . . he's in the Yellow Pages.



Representatives in principal cities of the free world.

Application tested! Proved!

# WHY HEAT TREAT PARTS? use **e.t.d. 150**

elevated temperature drawing (150,000 psi tensile)

**ALLOY STEEL BARS**

- e.t.d. 150 Alloy needs no heat treating!**
- e.t.d. 150 Alloy has 150,000 psi tensile guaranteed!  
(Rockwell C32 minimum)**
- e.t.d. 150 Alloy machines better than heat treated  
alloy steels!**



## Here are cost-reducing advantages

(1) Heat treating problems, costs (and secondary operations) are eliminated. (2) "e.t.d." 150 machines better than heat treated in-the-bar alloy steels. (3) Tool life and finish are excellent. (4) No quench cracks or distortion from heat treatment. (5) "e.t.d." 150 has exceptional strength and hardness uniformity across the bar. (6) End cost of parts is greatly reduced.

Use this coupon to request Helpful Data Bulletin 22.

***La Salle* STEEL CO.**

1438 150th St., Hammond, Ind.

Manufacturers of  
**STRESSPROOF®**, **FATIGUE-PROOF®**,  
and a complete line of  
cold-finished steel bars.

Name \_\_\_\_\_

Title \_\_\_\_\_

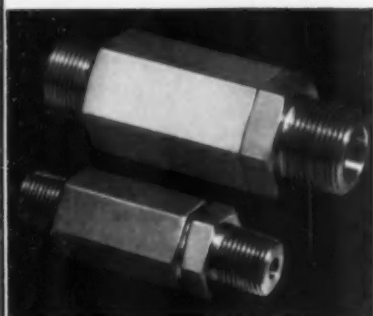
Company \_\_\_\_\_

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City \_\_\_\_\_ Zone \_\_\_\_\_ State \_\_\_\_\_

Available from your Steel Service Center

## KOHLER PRECISION CONTROLS



**New high pressure,  
in-line, relief valves  
with low hysteresis**

**MATERIAL**—Aluminum, Steel,  
Stainless Steel

**CONNECTIONS**—All Types

**WORKING PRESSURE**—1500 to  
3000 PSI

**PROOF PRESSURE**—2250 to  
4500 PSI

**BURST PRESSURE**—3750 to  
7500 PSI

**OPENING PRESSURE**—0 to 2250 PSI

**RESEAT PRESSURE**—10% Below  
Opening Pressure

**LEAKAGE**—0 at Reseat Pressure

.....

**Ultra-sonic cleaning facilities.**  
Kohler valves and other precision  
parts are assembled, tested, and  
packaged in dust controlled areas  
for minimum contamination.

**Complete facilities in one plant,**  
under unified supervision, insure  
reliable quality control and  
prompt deliveries. Kohler valves,  
fittings and parts are used by  
leading manufacturers for indus-  
trial equipment, automotive, air-  
craft and missile applications.  
Write for catalog.

Kohler Co. Established 1873  
Kohler, Wis.

## KOHLER OF KOHLER

Enameled Iron and Vitreous China Plumbing  
Fixtures • All Brass Fittings • Electric Plants  
Air-Cooled Engines • Precision Controls

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fields is studied. Suitably-selected materials for the critical areas, i.e., turbines, combustion liners, and heat transfer surfaces have proved to be fully reliable in actual engine tests, indicating that the requirements for durable metals can be met. Considerable development has occurred in the area of casting complete turbine wheels, materially reducing the total cost of the engine. Turbine wheels are expected to have a life of at least 100,000 miles. After that they can be replaced "with less difficulty than putting new rings into a reciprocating engine."

A new 75 hp gas turbine weighing only 50 lb is currently being tested in an Army jeep under supervision of the U. S. Ordnance Tank Automotive Command in Detroit. This engine, designed by Williams Research Corporation, Walled Lake, Michigan, is claimed to be the smallest gas turbine ever tested in any vehicle. Such developments are primarily directed toward military applications today, but their significance for the sports cars and passenger autos of tomorrow seems clearly indicated. Time will tell whether the automotive gas turbine will become an engineering specialty of limited use, building only a few hundred units per year, or develop into the mass production engine of the world. ■

## Brake Shoe Savings

A new program to save Rambler owners up to half the cost of replacing brake shoes has been instituted by American Motors Corp.

"This program will be a boon to the brake shoe replacement business of Rambler dealers because of the lower and more competitive prices," John S. Krider, general parts and accessories manager, declared.

The savings are made possible through the use of reconditioned metal brake shoe cores, to which new top-quality linings are bonded. Only cores which are like new will be used in the exchange program, Mr. Krider said.

This service is available for all Ramblers built after 1955.

*Why Die Stamped  
Circuits by  
Dytronics?*

## EXACT CIRCUIT DUPLICATION

**... 25,000 or  
5,000,000 units**

One of the major problems in printed circuitry is exact duplication of the circuit pattern from unit to unit. The Dytronics die stamped process eliminates this headache by utilizing a metal-cutting die to delineate the conductor pattern exactly whether 25,000 or 5,000,000 circuits are produced.

A new booklet, "Designing with Dytronics Die Stamped Circuits," gives other important reasons for specifying these quality circuits and provides information that will help you design them. Write for a free copy.



**Dytronics**  
INCORPORATED

ROCHESTER 49, MICH.

A subsidiary of Taylor Fibre Co.,  
Norristown, Pa.

Circle 181 on Inquiry Card for more data



# NEW Binks pump delivers 15 G.P.M.

pumps paint to 50-60 stations  
a block away and 6 stories up!

The all new Binks Model 41-6900 Hi-Capacity Pump is designed for hard continuous duty in paint circulating systems where large quantities of paint must be pumped through miles of piping.

The new Binks 3 $\frac{1}{4}$  to 1 ratio air operated pump has proved performance in large automotive plants where they have been running constantly for more than eight months, *making over one million strokes, with no downtime!* One manufacturer pumps paint 6 stories high from remotely located mixing tanks to 50-60 spray stations a block away!

#### Check these NEW pump features:

**New** air motor which adjusts automatically to the amount of

paint used. Pumps on both the up and down strokes. You get more paint with less pulsation.

**New** unit design means you can make rapid and simple replacements without dismantling the air motor.

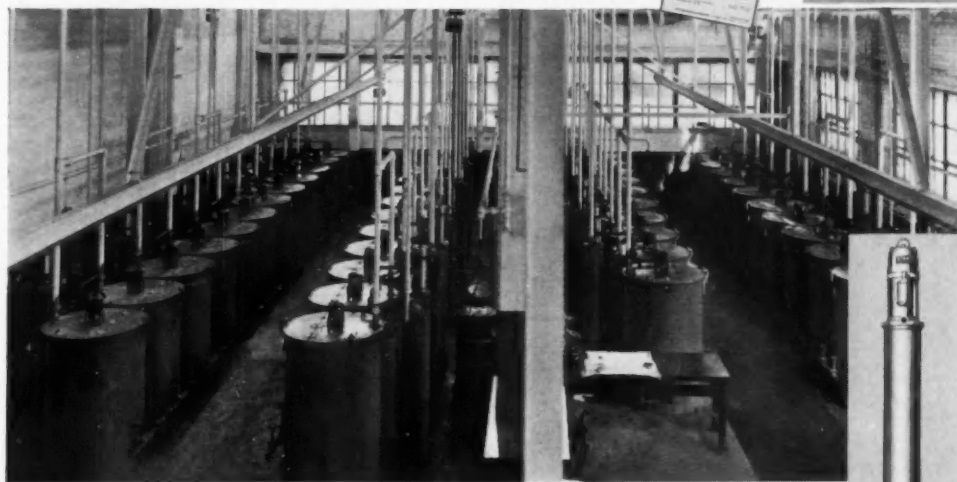
**New** nylon fluid valve discs with hardened seats prevent valve chatter and shock noise. They're reversible, too, for longer life.

**New** piston arrangement extends seal life.

**New** ball check allows free delivery of material with least restriction . . . less air consumption per gallon of material delivered.

**Plus . . .** all parts subject to wear are made of special steel, hardened for longer life.

Ask for Bulletin A41-23 to get all the facts. For your copy see your local Binks Distributor or write us.

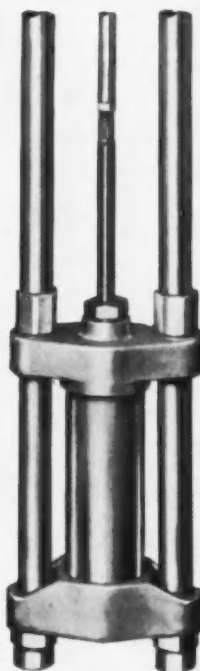


Ask about our spray painting school. Open to all . . . NO TUITION . . . covers all phases.

**Binks Manufacturing Company** 3134 Carroll Avenue, Chicago 12, Ill.  
REPRESENTATIVES IN PRINCIPAL U.S. & CANADIAN CITIES • SEE YOUR CLASSIFIED DIRECTORY



- New air motor
- New unit design
- New nylon fluid valve discs
- New piston arrangement
- New ball check



New Binks Model 41-6900 Hi-Capacity Pump

1233

## Binks Everything for spray painting

# 2 durometers molded in 1 piece!



Water Inlet  
55 and 80 Durometer

Write  
for  
Sample!

■ Geauga's transfer molding process lets you combine hard-soft functional sections in one molding operation. Eliminates cost of cemented fabrications and possibility of field failure. And its low cost will surprise you.

Available in Buna, GRS, Butyl, Rubber



**GGAUGA INDUSTRIES CO.**  
A Subsidiary of Carlisle Corporation  
MIDDLEFIELD, OHIO

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## FREE TEST SAMPLES Show How MINI-MITE miniaturized SET SCREWS CUT YOUR COSTS!

ACTUAL  
SIZE



Blowup shows precision made MINI-MITE Set Screws with perfectly formed heads which assure easy insertion of driving tools.

For miniaturized applications Setko MINI-MITE Set Screws can cut your costs in four important ways. Reduces initial cost, no extra charges are incurred because of special design. Increases production rates because MINI-MITES are made with watch makers precision, threads mesh precisely—insert perfectly. Cuts down on rejects in sub or final assembly because of consistent uniform quality. Immediate availability in Slotted, Socket and Socket Cap types in sizes #0, #1, #2 and #3 and in a wide selection of metals, finishes, lengths and points to choose from.

**FREE TEST SAMPLES** Send Today for your Free test samples of MINI-MITES or send your specifications and we will send samples.

**Set Screw & Mfg. Co.**

16 Main Street,  
Bartlett, Illinois

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ON OUR  
**WASHINGTON WIRE**

A major study of the effects of air pollution—primarily that stemming from vehicle exhausts—is under way in California. The study, termed the largest research effort of its kind by U. S. Public Health Service officials, is being conducted by the Los Angeles County Air Pollution Control District and the University of Southern California. Mice, guinea pigs and rabbits will be housed at four test stations to study the effects of smog on them.

U. S. exporters may find it increasingly difficult to trade with Europe due to the Administration's interest in fostering European trade groups. Treasury Secretary Douglas Dillon says the U. S. is willing to "pay a price" to foster unity in Europe between the Common Market and the European free trade association. The "price" will be tougher European policies toward U. S. exporters.

The growth of markets for machine tools in countries other than big industrial nations is the biggest surprise expected to come out of the Commerce Dept.'s report on machine tool movements in world markets. The report will show that American machine tool exporters are missing the boat in sales to the less developed countries. The growing metal-working equipment buying in these lands has been taken up by experts from Russia and Japan.

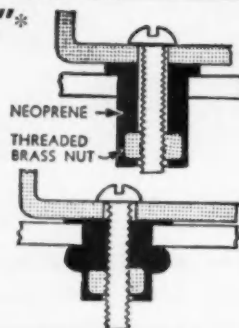
AFL-CIO researchers forecast the average wage increase coming out of union bargaining this year will range from nine to 13 cents an hour. They believe wage gains will be held down because of poor business conditions. They say most wage benefits will be moderate in size. They mean about the same as those coming out of 1959 and 1960 settlements.

## Use "WELL-NUTS"\*

where assemblies

must be

air-tight, water-tight



The Well-Nut has all the good points of a perfect sealing fastener: fast, easy assembly . . . spaces and fastens simultaneously . . . accepts conventional threaded fasteners . . . dampens vibration . . . holds panels too thin for self-tapping or set screws.

Send for literature and samples

\*Patented

**ROCKWELL PRODUCTS CORPORATION**

Dept. C, 146 Central Ave., Newark 3, N. J., MA 3-7650

Circle 182 on Inquiry Card for more data

# HOW TO BE SURE YOU GET THE RIGHT TOOL FOR THE JOB

Call in your Rotor Analyst. Have him study your assembly work. He has the know-how. He has the complete line of assembly tools. His recommendations are unbiased to give you the right tool for the job.

Call the nearby Rotor office or write for bulletin. The Rotor Tool Company, 26300 Lakeland Blvd., Cleveland 32, Ohio.

## ROTOR ASSEMBLY TOOLS

**TYPES:** Screwdrivers, nutsetters, impact wrenches, angle wrenches, stall tools.

**CAPACITIES:** From No. 1 screw to over 1"...0 to over 300 ft. lbs.

**SPEEDS:** Wide range...the *right* speed for your job.

**CLUTCHES:** Direct, positive, adjustable (cushion), RotorK or impact.



RIGHT ANGLE NUTSETTER.



HEAVY DUTY IMPACT.



ROTORK SCREWDRIVER.



NON-REVERSING NUTSETTER.



Here's the **RIGHT**  
TOOL for **YOUR** job!



# ROTOR TOOLS

The Rotor Tool Company - Cleveland, Ohio  
SUBSIDIARY OF THE COOPER-BESSEMER CORPORATION

**ROTOR AIR TOOLS:** Assembly Tools • Drills • Small Wheel Grinders • Straight Grinders  
• Vertical Grinders • Scalers • Chippers • Rammers • Special Tools • Air Motors  
**ROTOR HIGH-CYCLE ELECTRIC TOOLS:** Grinders • Polishers • Sanders

# From Blueprint To Plastics Product **CONSOLIDATED**

gets it  
done!

At Consolidated, we take the designer's concept and turn it into exciting, satisfying reality.

Consolidated has always handled the tough jobs—the special jobs that "couldn't be made from plastics." And today at Consolidated we're still pioneering—still finding new, better ways to work with newer, better materials.

Most of America's blue chip companies are on the honor roll of Consolidated customers. How About You?



FOR THREE QUARTERS  
OF A CENTURY  
YOUR BLUEPRINT  
IN PLASTICS

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## MORE GOVERNMENT CONTRACT AWARDS

**L**ATEST contracts awarded by various Government agencies, and covering primarily automotive and aviation products, are listed in the following. Typical of the items contained in these monthly listings are: passenger cars, motor trucks, aircraft, military tanks, engines, transmissions, other components, spare parts, plant equipment, etc. This list is for the period Mar. 31 to May 1 inclusive.

**AIR CARRIER SERVICE CORP.**, Washington, D. C.  
Aircraft, 1 ea.—\$83,700

**AMERICAN MOTORS CORP.**, Detroit, Mich.  
Automobiles, 38 ea.—\$53,992

**AMERICAN MOTORS CORP., AUTOMOTIVE EXPORT DIV.**, Detroit, Mich.  
Automobiles, 10 ea.—\$11,890

**AUTOMATIC TRANSPORTATION CO., DIV. YALE & TOWNE MFG. CO.**, Chicago, Ill.  
Truck, fork lift, 8 ea.—\$61,875

**BAKER INDUSTRIAL TRUCKS, DIV. OTIS ELEVATOR CO.**, Cleveland, Ohio  
Truck, fork lift, 61 ea.—\$904,352

**BASHAW ARCTIC MACHINERY, INC.**, Anchorage, Alaska  
Snow Vehicles, 2 ea.—\$10,968

**CARLISLE CORP.**, Carlisle, Pa.  
Inner tubes, pneumatic aircraft, 18,644 ea.—\$176,715

**CHRYSLER MOTORS CORP.**, Washington, D. C.  
Motor vehicles, various, 369 ea.—\$799,979

**CHRYSLER MOTORS CORP.**, Detroit, Mich.  
Trucks & automobiles, 113 ea.—\$243,442

**CINCINNATI MILLING & GRINDING MACHINES, INC.**, Cincinnati, Ohio  
Grinding machine, 1 ea.—\$33,955

**CROWN COACH CORP.**, Los Angeles, Calif.  
Buses, 5 ea.—\$192,503

**W. S. DARLEY & CO.**, Washington, D. C.  
Fire Truck, 1 ea.—\$13,848

**DAVEY COMPRESSOR CO.**, Kent, Ohio  
Engine, gasoline, 80 ea.—\$33,600

**DELAWARE VALLEY MACHINERY, INC.**, Washington, D. C.  
Lathe, vertical turret, 1 ea.—\$49,900

**DOUGLAS AIRCRAFT CO.**, Santa Monica, Calif.  
Trailers—\$450,000

**FORD MOTOR CO., FORD DIV.**, Dearborn, Mich.  
Automobiles, 2,087 ea.—\$2,976,058

**FORD MOTOR CO., FORD DIV.**, Washington, D. C.  
Motor vehicles, various, 562 ea.—\$876,866

**FORD MOTOR CO., FORD DIV.**, Dearborn, Mich.  
Trucks, various, 809 ea.—\$2,719,496

**GENERAL MOTORS CORP.**, Detroit, Mich.  
Station Wagons, 6 ea.—\$15,445

**GENERAL MOTORS CORP., CHEV. MOTOR DIV.**, Detroit, Mich.  
Motor Vehicles, 17 ea.—\$33,254

(Continued on page 142)





**1 design planning**  
using long and varied experience, Mahon engineers work with your staff on initial layout stages

## MAHON'S INDUSTRIAL EQUIPMENT DIVISION . . .

### designs equipment but engineers results

from start to any finish your products require . . . in a coordinated, fully responsible, one-source service

The 'finishing touch' of Mahon means more than just painting equipment—it means peak-efficiency methods for the best finishing of quality products. Mahon's Industrial Equipment Division provides a unique one-contract service that is safe, sure—and more often than not, the most economical—answer to any industrial finishing problem. Mahon's multiple-area benefits are worth investigating. Get in touch with Mahon and prove it for yourself.

### Mahon industrial equipment

complete finishing systems • metal-cleaning equipment • pickling equipment • painting facilities—spray, dip and flow coating • drying and processing ovens • special process equipment

**2 fabrication**  
of approved design is made, tested, shipped and installed by one organization—Mahon . . . to facilitate use.



**3 erection & installation**  
of equipment and structures is speeded by skilled Mahon crews, completely familiar with finishing systems.



**4 service**  
by Mahon means constant, trouble-free production of your quality products for maximum investment return.



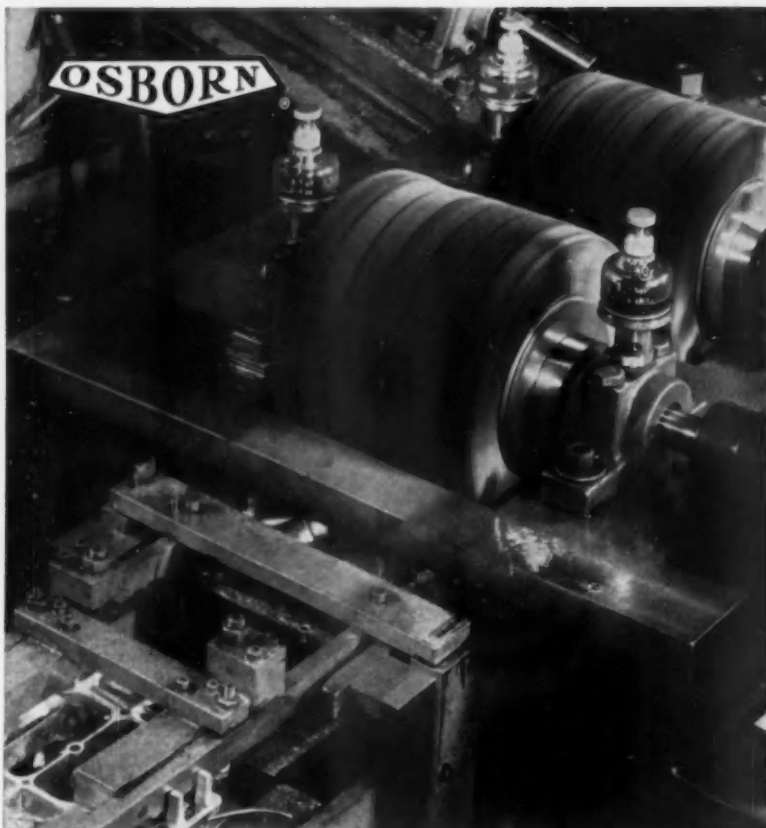
WRITE FOR MAHON CATALOG A-661—ALSO IN SWEET'S P. E. FILE YOUR BIGGEST VALUE IS IN MAHON'S PLANNING & ENGINEERING EXPERIENCE

**THE R. C. MAHON COMPANY**  
DETROIT 34, MICHIGAN

MANUFACTURING PLANTS—  
Detroit, Michigan and Torrance, California

SALES-ENGINEERING OFFICES—Detroit, New York, Chicago, Cleveland,  
San Francisco, Torrance and E. Orange, N. J.

# MAHON



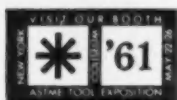
**AUTOMATIC FLASH REMOVAL SETUP** for die-cast zinc carburetor parts. Two brushing heads—each made up of seven Osborn Master® Wheel brushes—are mounted over the conveyor. Parts (shown fixtured in lower left corner) pass under brushing heads where all flash is removed as they travel to next work station.

## OUTPUT TRIPLED from 200 to 600 an hour with OSBORN power brushing

*Before:* this auto equipment maker was using costly off-hand methods to remove flash from these die-cast zinc carburetor parts. Production was slow . . . it varied from shift to shift, averaging about 200 pieces per hour.

*Now:* parts are Osborn power brushed clean as they travel between work stations by conveyor . . . *eliminating manual handling.* The setup of Osborn Master® Wheel brushes does the job at rates up to 600 pieces per hour . . . *three times as fast.* The operation is simple, inexpensive. Results are uniform, with excellent quality control.

This application is typical of how your tough metal finishing problems of every description—deburring, cleaning, polishing, precision blending—can be solved with today's Osborn power brushes and brushing methods. An **Osborn Brushing Analysis**—made at no obligation in your plant now—is the first step. Write or call *The Osborn Manufacturing Company, Dept. E-96, Cleveland 14, Ohio. Phone ENdicott 1-1900.*



Booth 2407



Metal Finishing Machines . . . and Methods • Industrial Brushes • Foundry Production Machinery

(Continued from page 140)

**GENERAL MOTORS CORP., CHEV. MOTOR DIV.,** Detroit, Mich.  
Trucks, various, 2,362 ea.—\$5,126,968

**GERLINGER CARRIER CO.,** Dallas, Oreg.  
Truck, straddle-carry, 2 ea.—\$30,200

**B. F. GOODRICH AVIATION PRODUCTS,** Akron, Ohio  
Aircraft tires, 2,725 ea.—\$120,445

**GOODYEAR TIRE & RUBBER CO.,** Akron, Ohio  
Tires & tubes, indefinite quantity, 3,053 ea.—\$133,050

**HENRY C. HOWELLS,** Washington, D. C.  
Grinding machine, 1 ea.—\$64,669

**INTERNATIONAL HARVESTER CO.,** Washington, D. C.  
Bus, Motor, 20 ea.—\$109,853

**INTERNATIONAL HARVESTER EXPORT CO.,** Chicago, Ill.  
Trucks, 4 ea.—\$16,551

**INTERNATIONAL HARVESTER CO.,** Washington, D. C.  
Trucks, various, 2,150 ea.—\$5,020,442

**KNOX SERVICE CENTER, INC.,** Fort Knox, Ky.  
Tires & tubes—\$43,000

**LYNCOACH & TRUCK CO., INC.,** Oneonta, N. Y.  
Trailer, Van, Mobile Dental Unit, 1 ea.—\$10,456

**McCULLOCH CORP.,** Los Angeles, Calif.  
Engines—\$317,884

**MEMPHIS COACH CO., INC.,** Memphis, Tenn.  
Automobile, Ambulance, 323 ea.—\$1,464,611

**MINNEAPOLIS-MOLINE CO.,** Hopkins, Minn.  
Truck, fork lift, 109 ea.—\$498,153

**NELSON TIRE SERVICE OF WISCONSIN,** Madison, Wis.  
Tires & tubes—\$13,000

**FRANK G. SCHENUIT RUBBER CO.,** Baltimore, Md.  
Tires and tubes, 9,409 ea.—\$75,281

**STUDEBAKER PACKARD CORP.,** South Bend, Ind.  
Motor Vehicles, 563 ea.—\$849,125

**SWIND MACHINERY CO.,** Philadelphia, Pa.  
Milling machine, 1 ea.—\$40,670

**TOWMOTOR CORP.,** Cleveland, Ohio  
Truck, fork lift, 18 ea.—\$86,143

**UNITED MANUFACTURING & ENGINEERING CORP.,** Independence, Mo.  
Semitrailer, Tank, 163 ea.—\$1,388,967

**UNITED STATES RUBBER CO.,** Detroit, Mich.  
Pneumatic aircraft tires, 26,144 ea.—\$2,289,384

**WARD LAFRANCE TRUCK CORP.,** Elmira Heights, N. Y.  
Truck, Tractor, 39 ea.—\$557,574

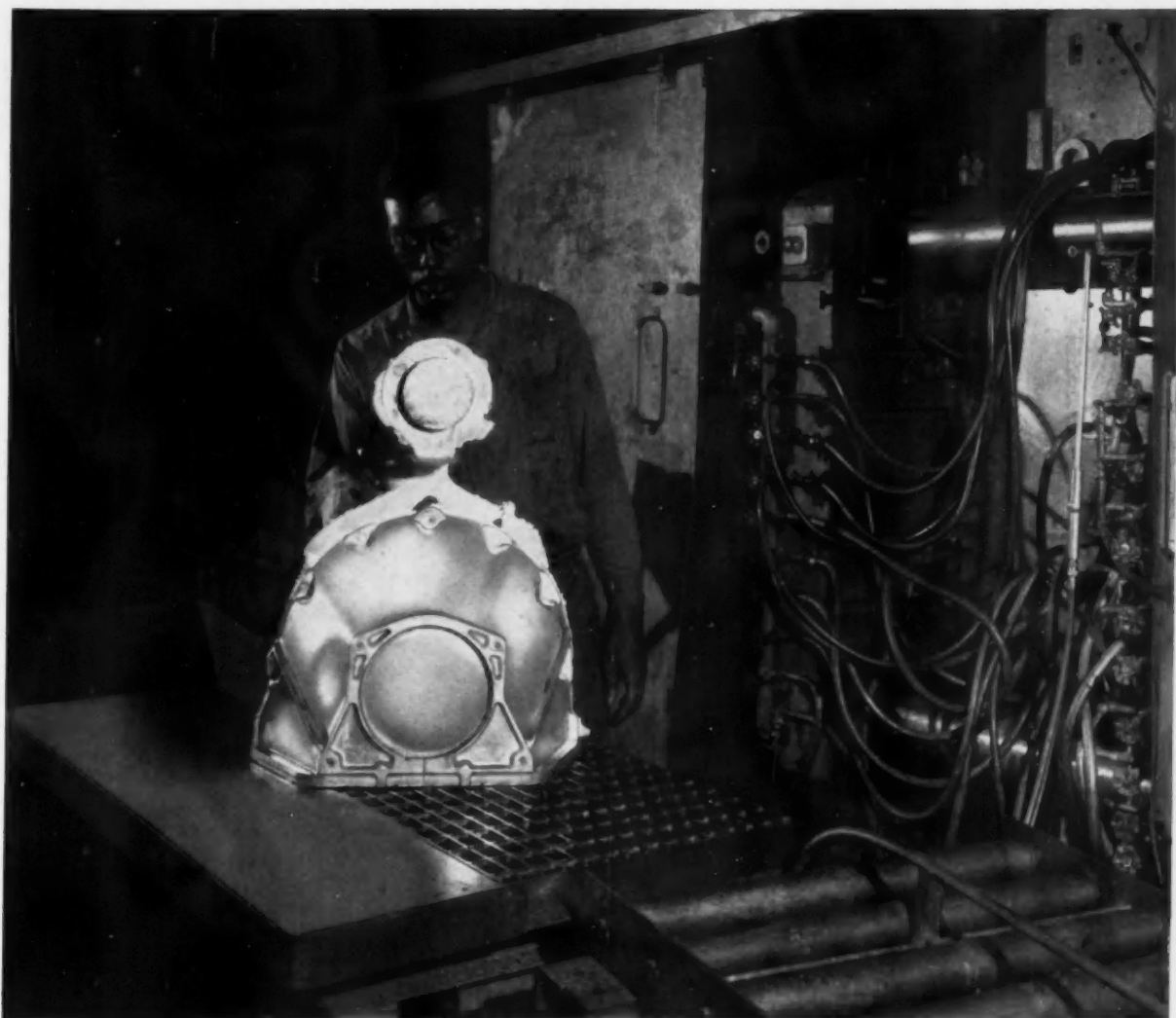
**WARNER & SWASEY CO.,** Cleveland, Ohio  
Lathe, turret, 3 ea.—\$54,889

**WATSON AUTOMOTIVE EQUIPMENT CO.,** Arlington, Va.  
Ambulance, 1 ea.—\$8,334

**WILLYS MOTORS, INC.,** Toledo, Ohio  
Trucks, various, 576 ea.—\$1,436,630

### Wolf Gets AMA Post

Raymond V. Wolf, manager-traffic dept., Ford International Div., has been elected chairman of the Automobile Manufacturers - Ocean Rate Committee.



1000-ton Cast-Master at Chrysler's Die Casting Plant, Kokomo, Indiana, produces 21 lb. torque converter housings.

### *Automotive Trend:*

## **EVERYTHING'S SMALLER BUT THE DIE CASTINGS**

It's a significant balance. Die castings get bigger as economic considerations put top priority on low cost die casting production. Complicated assemblies are unit cast in one operation. Parts are lighter, rust free, easier to machine, easier to produce, less costly.

Cast-Master die casting machines have met many of these new challenges in a line that fills every need from a few ounces to 85 lbs. From tiny carburetor part to engine block, Cast-Master has the machines; machines with interchangeable injection ends for hot or cold chamber casting, positive mechanical mold

clamping, fast hydraulic injection principles.

If you're ready for die casting, standardize with Cast-Masters, the machines you can count on for more profit, more dependable production. Want to test a new product mold? Write Cast-Master for details on their Lab Test Program.

H115

H-P-M DIVISION - KOEHRING COMPANY

# **CAST-MASTER**

23901 AURORA ROAD, BEDFORD, OHIO

# A METHOD FOR PROJECT Management

(Continued from page 81)

**MILESTONE** Milestones will be established for each project to mark dates, events or accomplishments which are important to one or more executives responsible for the management of

the project. Criteria for a milestone may be completion of a task, critical designs or tests, customer approvals, contractual requirements, expenditure of 50 per cent and 85 per cent of project funds, re-estimate points, special dates or accomplishments and periodic review dates.

**REVISIONS** At intervals set forth in the project plan, each project will be reviewed and tasks, standards, and milestones will be revised as necessary. Reviews will be accomplished at inter-

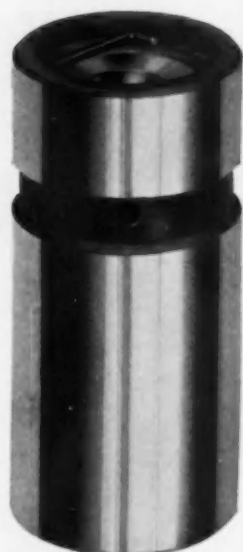
vals not exceeding three months and generally at the completion of the following: Preliminary analysis and firming up of concept, layout and schematic drawings, detail drawings for release to shop and assembly of prototype. Recommended revisions will be submitted for approval in the same manner as the original plan.

**TIME SCHEDULE** Sequence of completion of tasks together with completion dates will be determined so as to permit completion of the overall project at a date not later than that specified by the manager (or the customer). Lead time items such as long delivery procurements will be listed separately, together with dates on which action should be initiated.

**MANPOWER SCHEDULE** The total man hours necessary to complete each task will be determined on the basis of the time schedule. The man hours can be converted into manpower by dividing the estimated man hours by the actual available working hours. The number of men required in each classification will be recorded on Form A. Manpower schedules should be realistic in terms of buildup and, if possible, designed to fit the optimum time schedule for the project.

**COST SCHEDULE** The cost standard for each task will be spread on a week-by-week basis or other such time period authorized as the scheduling basis for the project. The task-by-task costs will be totaled into the total cost spread for the project. This becomes the basis of the line graph for the project schedule.

**CHARTS AND GRAPHS** The project head and the task supervisor will keep such charts of a uniform nature as are required to prosecute the work in accordance with the plan. The charts supplied the successive levels of management shall indicate the milestones in which they are interested. The sample depicting a hypothetical one-task project is a type suitable for the Manager. The chart indicates that the Layout required two weeks longer than anticipated and the Design started later than scheduled. Full predicted manpower



for all engine applications

## JOHNSON tappets

Keeping ahead with the latest tappet developments is a full-time job at JOHNSON PRODUCTS. All of our design engineering and manufacturing improvements go toward giving your engine the right kind of tappet performance.

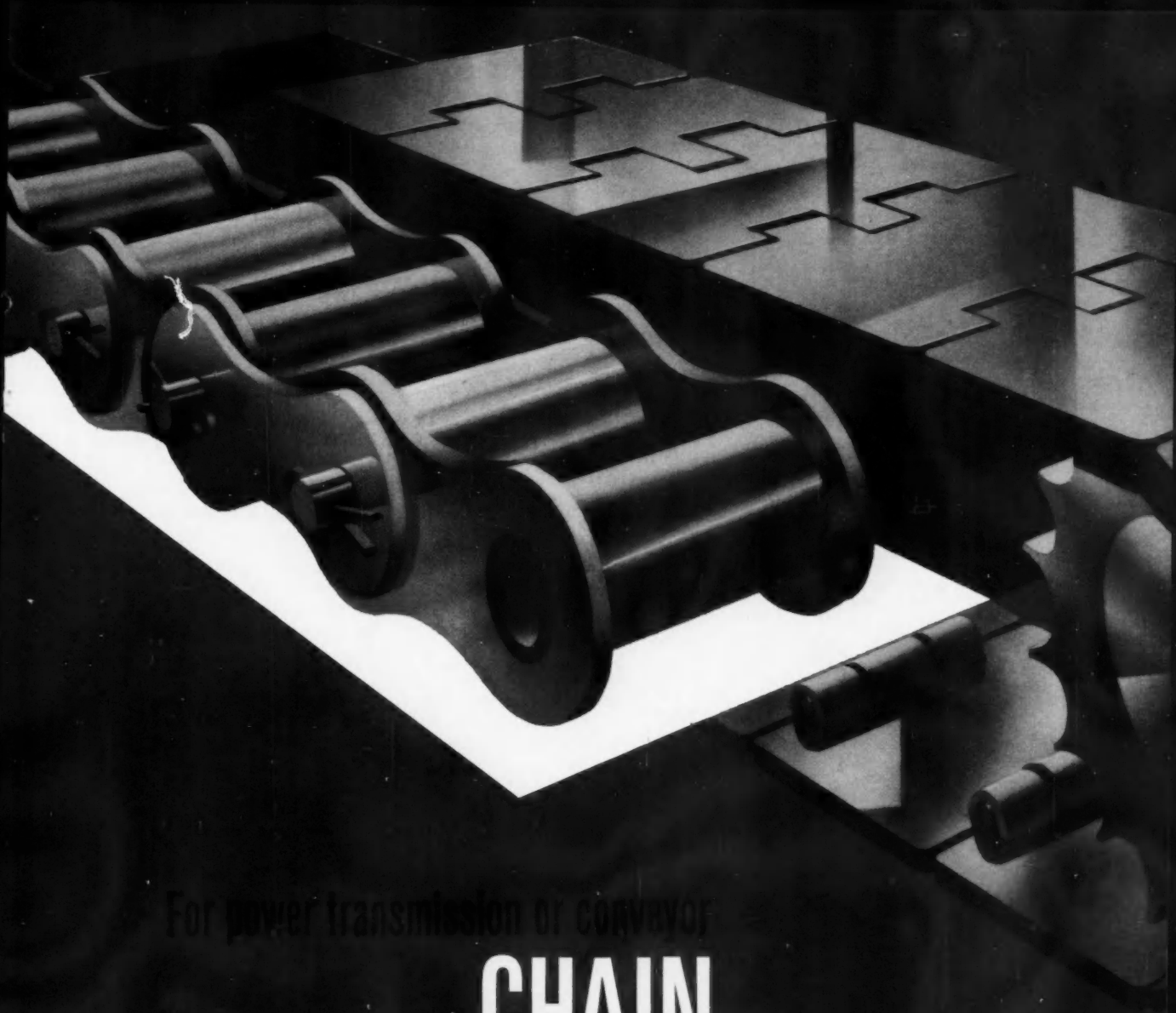
We think the results speak for themselves: Johnson Tappets are *high in quality, competitive in price*. As tappet specialists, we welcome the opportunity to show you how well the job can be done.



"tappets are our business"

**JOHNSON  PRODUCTS**  
MUSKEGON, inc. MICHIGAN





For power transmission or conveyor

# CHAIN

## Superior STAINLESS

foils corrosion—lengthens life

The Superior Stainless combination of higher strength for heavier loads, abrasion resistance for longer wear, and corrosion resistance for maximum service life and cleaning ease is well illustrated in these applications by Atlas Chain & Manufacturing Co. Plus values to the maker are Superior's uniform fabricating ease and dependability—prompt deliveries—close cooperation at all times. Why not enjoy these benefits for *your* stainless strip applications? Call us!



**SUPERIOR STEEL DIVISION**

OF  
COPPERWELD STEEL COMPANY  
CARNEGIE, PENNSYLVANIA

For Export: Copperweld Steel International Company, New York



is not being used. If each line represented one man, then four are being used when the estimate for job completion was based on five men for three months and four men for the last month.

The progress curve is based on the ratio of time already spent to that time plus the amount estimated to complete the program. The curve also indicates that the

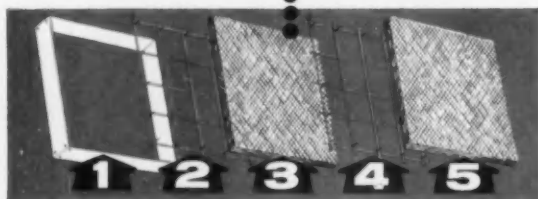
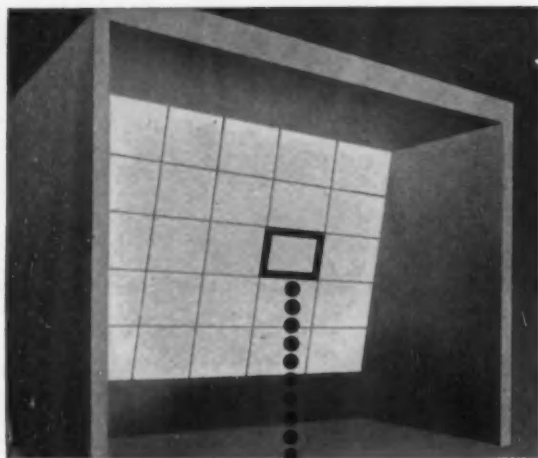
funds were being expended at a rate greater than scheduled. This may have resulted in a change of scope and a change of design notice was issued 1 November to authorize the re-schedule.

A milestone is indicated at the 85 per cent point of funds expended because this is frequently a time of program evaluation by the customer.

## CHECK LIST

- 1 Open job order number for planning
- 2 Establish contractual check lists
  - a Deliveries (hardware, reports, etc.)
  - b Statement of work (technical objectives)
  - c General contract requirements (overtime, source inspection, etc.)
- 3 Establish task definitions and tentative milestones
  - a Task objective meaningful and realistic
  - b Objectives in terms of accomplishment
  - c Adequate identification for each accomplishment
  - d Each task the responsibility of one person
- e Finite completion criteria for each task
- f Work content of each task reasonably homogeneous
- g Time span for each task short enough to be helpful, but long enough to allow flexibility
- h Cost standard reasonable for each task
- i Tasks the natural way in which the project head thinks of the job
- j Tasks sequentially scheduled to serve as measurements of progressive accomplishments of the overall job
- 4 Establish time standards for each task
  - a Time schedule provides for completion in accordance with the contract
- b Time schedule realistic
- 5 Drawing release plan
  - a Long lead times identified
  - b Dates realistic
- 6 Establish first draft of lead time charts
  - a Task sequence realistic in terms of prerequisite data produced in prior tasks
  - b Ample lead time provided for all items
- 7 Establish cost standards for each task
  - a Estimates realistic
  - b Estimating procedure documented for reference on future jobs
- 8 Establish Manpower schedule
  - a Manpower available
  - b Schedule realistic
- 9 Establish organization and responsibilities
  - a Key people designated
  - b Key people available
  - c Relationships and responsibilities clearly stated in writing
  - d Responsibilities realistic in terms of expectation
- 10 Responsibility assigned for each task
  - a Summary

(Turn to page 148, please)



A Paint Arrestor module consists of a Holding Frame (1), two Snap-in Grids (2 and 4), two Paint Arrestors (3 and 5). Loaded Paint Arrestors are simply replaced as necessary. And, they're also ideal for air-borne ink, mist, dye, frit, etc.

## CONTROL PAINT OVERSPRAY the inexpensive, effective way!

The advantages of R P Paint Arrestors, the inexpensive, disposable air filters are many. Overspray solids are trapped before they reach the exhaust stack... to reduce fire hazards, damage to adjacent property... disagreeable and time-consuming maintenance work. Installation? —easy and fast. Maintenance? —remove loaded Paint Arrestor and replace a new one. Adaptability? —ideal for any type, any size booth, new or existing.

## RP PAINT ARRESTORS



*Products of Research*



**RESEARCH PRODUCTS Corporation**

Dept. 310-E, MADISON 1, WISCONSIN



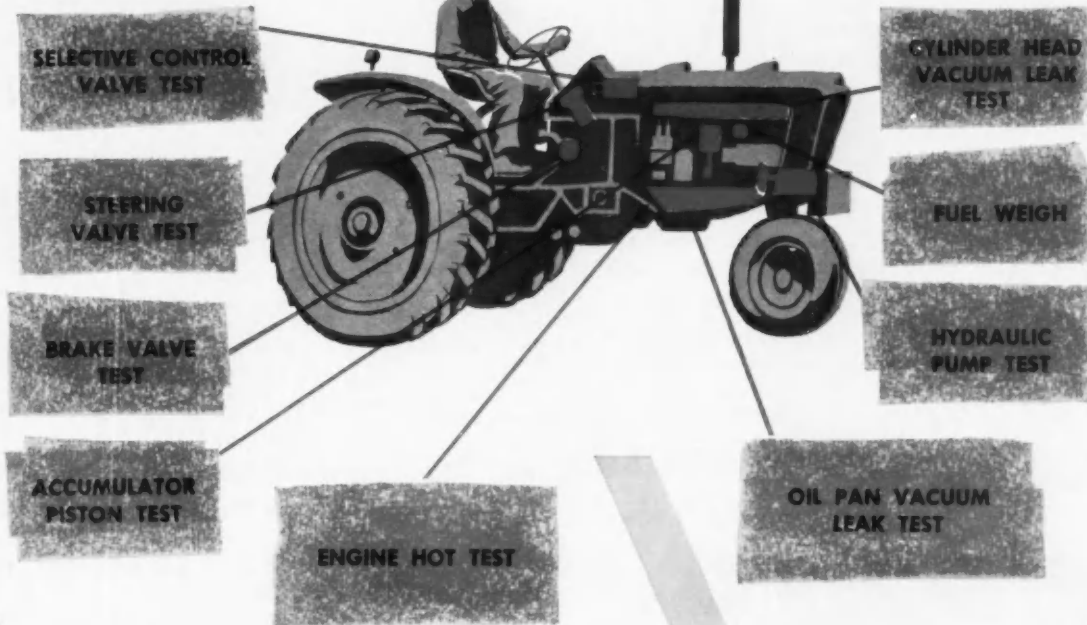
# Tested for **QUALITY** by **CONTROL Engineering Co.**



CYLINDER TEST STAND



ROCKSHAFT TEST STAND



## Unified responsibility for quality control requirements

Any product can be made better by better testing. Control Engineering Company specializes in designing and manufacturing testing equipment . . . custom engineered to meet your specific requirements. The illustration above shows eleven important tractor parts that were tested for quality on Control Engineering test stands.

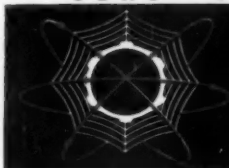
Applying new methods of testing the performability of your products will pay for themselves quickly because the field conditions under which this part must perform are duplicated in your plant. This method of inplant testing maintains top quality, provides dependable per-

formance records and eliminates costly service and replacement.

There is hardly a manufacturing plant of any kind—including yours—where the right application of quality control methods and equipment won't produce savings many times the cost involved.

The field engineers of Control Engineering Company represent the most complete and versatile line of test equipment available through any one source, and have the real "know how" in today's modern methods of Quality Control.

SEND FOR FREE BROCHURE ON TEST STANDS



## CONTROL ENGINEERING COMPANY

A SUBSIDIARY OF JERVIS B. WEBB COMPANY

8007 Joy Road • Detroit 4, Michigan

# NEW NYLAFLOW<sup>®</sup> PRESSURE HOSE

*Weights 1/5 as  
much...outperforms  
rubber hose of same  
burst strength*

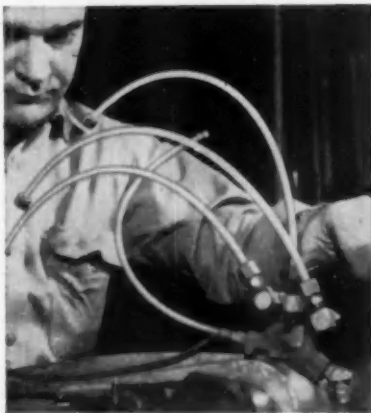


Flexible NYLAFLOW Pressure Hose\* is Polymer's newest answer to jobs requiring exceptional resistance to flex and vibrational fatigue.

Available in burst pressure ratings of 5,000 up to 12,000 psi., and in long, continuous lengths and standard inside diameters up to 3/4" . . . with compact, lightweight, reusable fittings or assemblies if desired.

## Typical Areas Of Profitable Application:

- Hydraulic, high pressure lubrication and pneumatic lines—Unaffected by flammable and non-flammable hydraulic fluids, an excellent non-conductor.
- Freon lines—Remarkably low effusion rate for refrigeration and air conditioning applications.
- Solvent or Hot paint lines—Unaffected by almost all organic solvents.
- Anhydrous ammonia lines—Unaffected by long term exposure as proven by tests.



## NYLAFLOW PRESSURE

**TUBING** in sizes up to 3/8" O.D., and burst pressure ratings of 1000 and 2500 psi. Ideal for lower pressure requirements. Flexible for easy installation with standard flare or compression fittings.

*Full details and illustrated  
brochures now available*

**WRITE TODAY!**



## INDUSTRIAL PLASTICS

THE POLYMER CORPORATION of PENNSYLVANIA, READING, PA.

EXPORT POLYPENCO, INC., READING, PA., U.S.A.

\*Patented

(Continued from page 146)

- b Authorization
- c Organization
- d Concept of operation
- 12 Assign job order numbers to tasks
  - a All job order numbers planned
  - b Currently needed order numbers opened
- 13 Establish final milestones
  - a Check points represented by milestones
  - b Management check points represented by milestones
  - c Milestones at meaningful intervals of time
- 14 Establish check points for project head
  - a Important dates and accomplishments identified in a timely manner
- 15 Costs
  - a Irregularly occurring costs identified and realistically entered
- 16 Establish final draft of lead time chart
  - a All task starts and ends indicated
  - b All milestones shown
  - c Parallel tasks combined where feasible
- 17 Approvals
  - a Each member of management and customer reviewed and approved his part of the plan ■

• • •

## New Nissan Plant

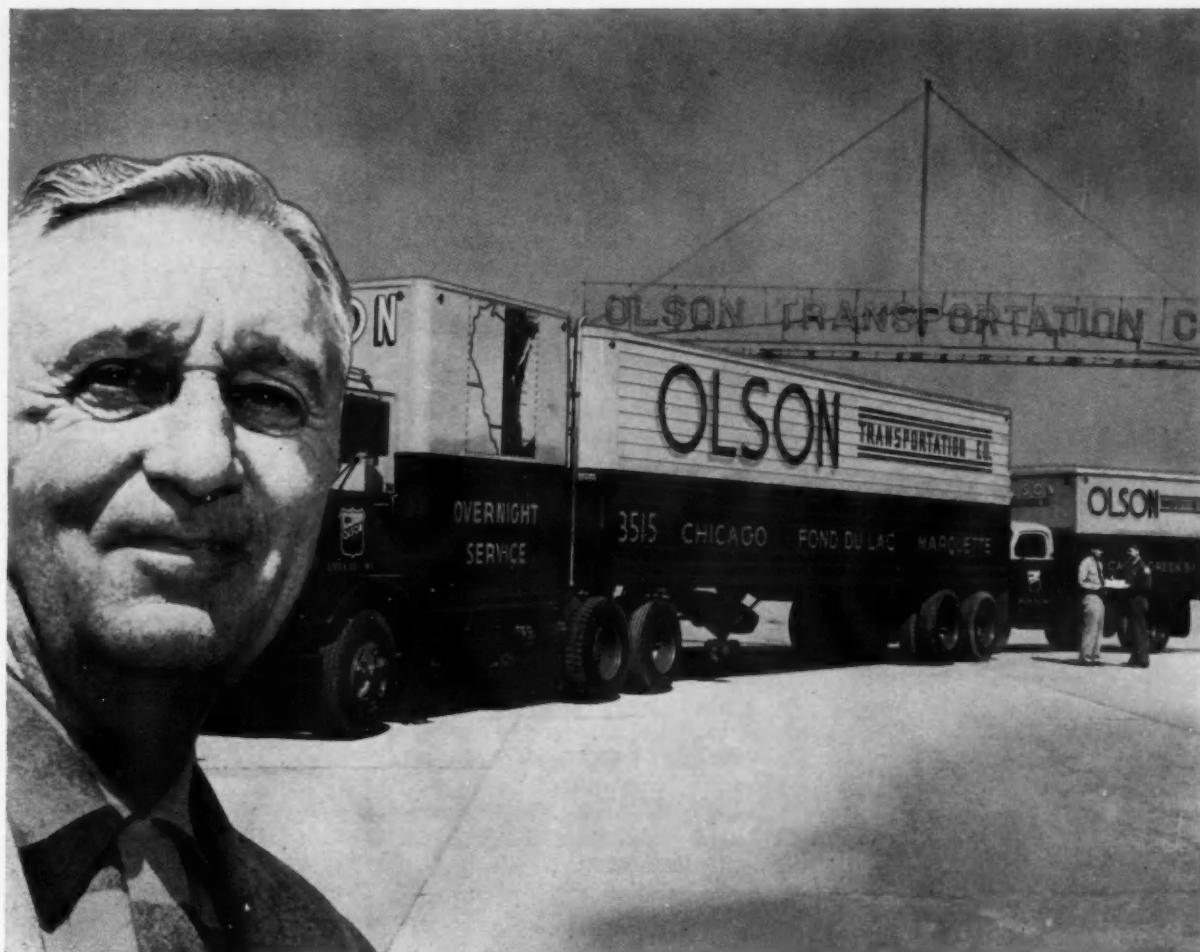
The Nissan Motor Co., Japan's second largest auto manufacturer, has begun a \$32 million construction program designed to consolidate its present passenger car production.

Ground was broken at Oppama, near Yokohama, for a new production complex that will include assembly, body, press and plating plants plus a laboratory and 115-acre test track.

At present, Nissan turns out its Datsun, Bluebird, Cedric and Fair Lady models at plants in Yokohama and in Yoshiwara, about 70 mi down the coast. Facilities of both plants will be transferred to the new Oppama site to create a single passenger car center. Nissan trucks and buses will continue to be produced at Tsurumi and Totsuka.

A company spokesman said the Oppama plant will have a monthly production capacity of 10,000 cars and when in full production it will nearly double the firm's annual output of 63,000 units.





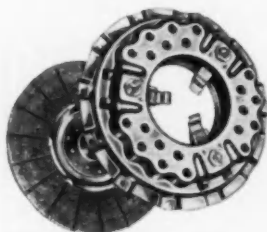
## "We average more miles with **LIPE CLUTCHES**"

*says Olson Transportation Co., Green Bay, Wisconsin*

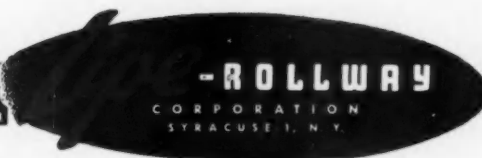
M. J. Madigan, Olson Maintenance Superintendent, remarks: "Some time back, we decided to give Lipe Clutches a thorough tryout as interchanges for original equipment. Our records show that they have produced more miles before overhaul than the clutches supplied with our units when new. Needless to say, we are very satisfied with these results."

Measure Lipe Clutch value by any standard you like . . . by ton-miles per year, by number of engagements or miles between teardowns, by vehicle use per repair dollar . . . and you'll agree with reports from all over the country that Lipe delivers more profit-building performance per dollar of cost. That's why . . .

***the trend is to LIPE!***



There is a Lipe Clutch to meet requirements of vehicles 18,000 lbs. G.V.W. and up; for torque capacities from 200 to 3000 ft. lbs. For application assistance and specific data, contact the Company direct.



# MORE POWER PER POUND



## WITH THE NEW SYNCR ALTERNATOR

Newest, smallest, yet in alternators! Measures 7¼" dia. x 5¼" long, weighs only 26 lbs., yet delivers 1500 watts, 110 vdc, at 1600 rpm.

Designed for refrigeration trucks, taxicabs, police cars and similar heavy duty applications. Also available in 15 volts DC, 1000 watt rating and in AC models.

A semiconductor regulator, supplied as an accessory, holds output to  $\pm 2\%$  over a speed range of 1000 rpm to 12,000 rpm. No-load to full load regulation is held to  $\pm 12\%$ .

Features radially oriented ceramic permanent magnets in the rotor. No brushes, commutators or slip rings.

If you need auxiliary electric power from a tight space, write for more details about this compact Syncro Alternator.

**SYNCR  
CORPORATION**  
OXFORD, MICHIGAN

Circle 196 on Inquiry Card for more data

## MACHINERY NEWS

(Continued from page 85)

build a machine for grinding circular grooves in rod mill rolls, thus permitting use of harder-metal rolls. The new machine will handle rolls up to six feet long and 14 in. diam, weighing up to 3000 lb. Its grinding wheel will be 30 in. diam by 10 in. wide.

**James F. Lincoln Arc Welding Foundation** — has announced a \$25,000 awards program for individuals submitting papers on progress in arc welded steel design. Two divisions are involved, one on a machine or machine component, and the other on a structure or structural component. The competition closes July 17.

**Committee of Tool Steel Producers** — has announced "Tool Steel Trends," a new booklet to be published every three or four months. Basic data on the use, application, and fabrication of tool steels are to be presented. For no-charge copies write the Committee, American Iron & Steel Institute, 150 E. 42nd St., New York 17.

**Government Publications** — four new Defense Metals Information Center Memos on explosive forming (PB 161 221), high-energy electrical forming (PB 161 220), electrical-discharge machining (PB 161 225), and large-size heat-treating furnaces (PB 161 213) are available, at 50 cents each, from OTS, U. S. Dept. of Commerce, Washington 25, D. C.

**Sidney Machine Tool Co.** — E. W. Wagner, former general sales manager, has been named vice-president and general manager of this Buhr Machine Tool Co. subsidiary.

**Thor Power Tool Co.** — Milton E. Slater has been appointed executive assistant to the president.

**Gisholt Machine Co.** — Ray Heizer has been appointed general sales manager for Gisholt Plastics, makers of molded fiberglass-reinforced Masterglas and Delwood plastic products.

**DeVlieg Machine Co.** — Robert M. Miller has been promoted to assistant sales manager of the company's Machine Tool Div. ■

*Yours for the  
ASKING...*

## the ALL-NEW AI EDITORIAL INDEX Vol. 123

Covering issues from  
July 1 to Dec. 15, 1960,  
inclusive

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The new Index quickly summarizes all the editorial articles alphabetically by subject along with page numbers and date of issues in which they appear. Articles are listed under several major classifications with considerable cross-indexing for quick reference.

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Please send me, without charge, the new **AUTOMOTIVE INDUSTRIES** Editorial Index covering the 12 issues from July 1 to December 15, 1960, inclusive (Volume 123).

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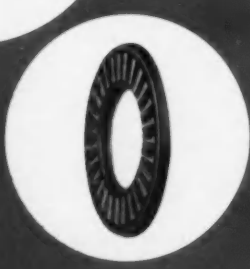
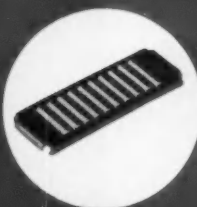
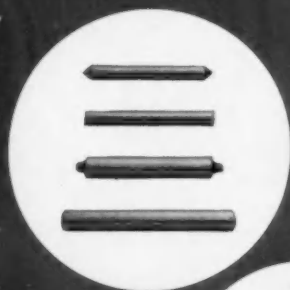
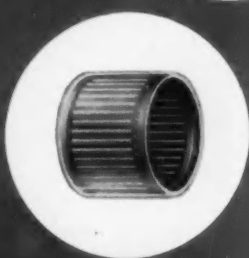
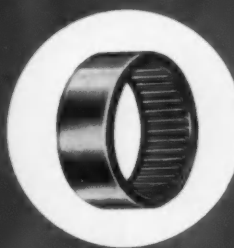
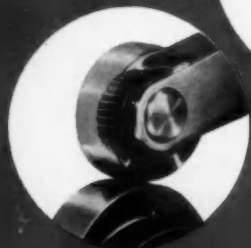
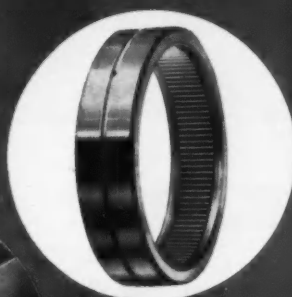
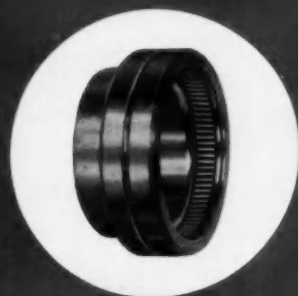
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Company .....

Company Address .....

City ..... State .....

# NADELLA



- ← COMPLETE
- ← NEEDLE BEARING
- ← NEEDLE BEARING WITHOUT INNER RING
- ← CAM FOLLOWER
- ← NEEDLE BUSH
- ← NEEDLE CARTRIDGE
- ← NEEDLE ROLLER
- ← NEEDLE ROLLER TRACK
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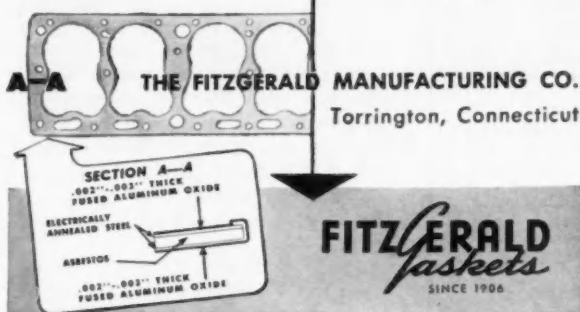
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## NEW PRODUCTS

(Continued from page 98)

### Soundproofing Material

Water proof insulating and soundproofing foam, for lamination into wood or metal, can be sprayed or poured. According to the manufacturer the lightweight polyurethane foam has a coefficient of thermal conductivity, or K-factor, of 0.14 at 75 deg F and a moisture vapor transmission of 0.92 perms.

A bond strength exceeding the tensile strength of the foam itself—42 psi—is reportedly obtainable on virtually any substrate including steel, treated aluminum, most plastics and wood. Spray and pouring applicators are commercially available for production operations. Experimental kits containing the resin and its freon catalyst may be obtained for \$2.50 including postage. *Foam Products Mfg. Ltd.*

Circle 65 on Inquiry Card for more data

### New Aluminum Alloy

A new aluminum alloy has been developed for exterior automotive trim applications. This material is said to be well suited for side molding and other applications where superior dent resistance is a prime consideration. Good strength characteristics and good ductility are features of the new alloy. The metal's anodized appearance is comparable to other aluminum alloys used by the automotive industry for bright trim parts.

Registered with the Aluminum Association as 5252, the new alloy has ultimate strengths of 35,000 to 45,000 psi, and yield strength of 30,000 to 40,000 in optimum ductility range. *Kaiser Aluminum and Chemical Corp.*

Circle 66 on Inquiry Card for more data

### "Slippery" Rubber

Through the use of chemical treatment processes a laboratory group has taken what they refer to as "the rub out of rubber." According to the report the material is slippery to the feel and touch yet retains the elasticity and other desirable properties of the natural or synthetic materials. *Quantum Inc.*

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panels  
or parts . . .

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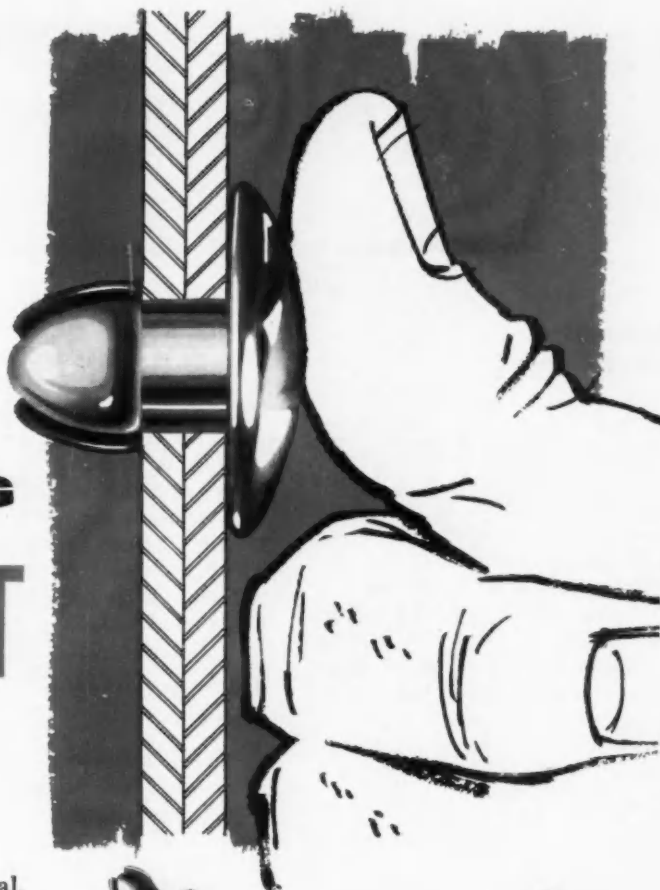
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# Observations

By Joseph Geschelin

## Automatic Transmissions

One of the large parts makers has been producing a US-designed automatic transmission in England for a number of years. We learned recently that there is now a demand for a smaller version for use in European compacts. The company is setting up a new plant to build the small drive. We wonder how automatic drive will suit the American buyers of small European cars considering the demand for straight stick shift.

## Tape Control

Sundstrand is in the process of building a group of eight tape controlled machines representative of its line of such equipment. This will include several types of three-axis machines; five-axis mills; contour mills; etc., some with automatic tool changers ranging from 20 to 60 tools. These machines will be employed to upgrade the machining of Sundstrand machine tools, demonstrating in the process the economy of numerical control for intricately-machined short run parts. Moreover, the same equipment will serve very well to illustrate the utility of such equipment for customers who can view the actual behavior of the machines in regular production. It's like having a perpetual machine tool show on tap.

## Numerical Control

Although tape controlled machine tools have not penetrated the ranks of large volume automotive machine shops, we have noted at least three distinctive applications recently. One of these is the Milwaukee-Matic installed at Detroit Diesel where it handles a large

variety of short order parts. Another is a Sundstrand tape controlled mill at John Deere. This unit is used for milling locating spots on a variety of crankshafts. Still another application is a DeVlieg machine at Allis-Chalmers for machining the end housings for tractors. Each example is one which handles a large number of different parts required in relatively small lots.

## Rolling Bolster

We have discussed recently the advent of the rolling or moving bolster press lines for handling a variety of stampings in batches. The first installation of note was the Clearing line at Fisher Body in Grand Rapids. Our attention has been drawn to the fact that Danly has been producing press lines of this character since 1957. Danly calls their presses QDC, quick-die-change. The reason nothing much has appeared on QDC installations is quite simple—all installations up to now have been shipped overseas. However, Danly is now shipping units to make up two separate press lines for one of the large Detroit motor car producers.

## How's Business?

We find that press manufacturers are enjoying real good business despite the let-down in motor vehicle production. Much of this is going to foreign plants—England, Brazil, Japan. But some of the orders are coming from domestic manufacturers. One bright note in the picture is that tractor and agricultural machinery manufacturers are beginning to show activity and are ordering machine tools as well as presses.

## Fickle Public

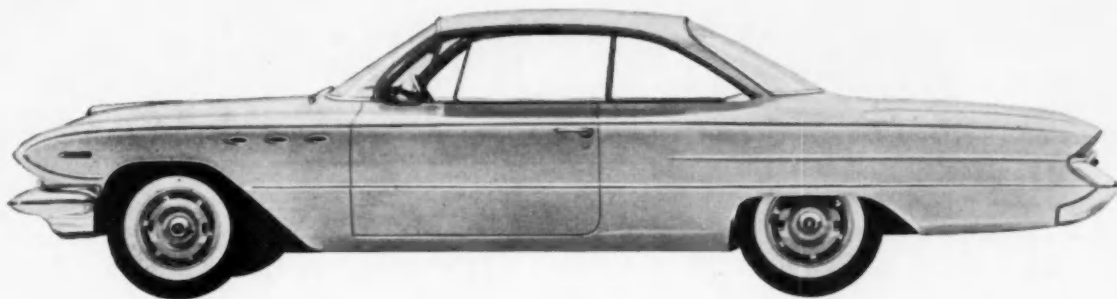
Does any one really know what the public wants in a motor car? Introduction of compacts and smaller-than-standard cars and soon compact-compacts or midgets was brought about by the great hunger for small, economical foreign cars. Then what happened? In the Corvair line the Monza model accounted for some 40 per cent of Corvair production recently. Valiant and Lancer started out with two lines—standard and deluxe—to meet just this eventuality. More recently a deluxe version of the Comet—with bucket seats in front—was brought out to fill the need for a more luxurious low-priced car. And the Falcon has been treated to a deluxe package for the same reason. Now then—does the public want a real low-priced car or do they want something a little doggie? The problem of guessing what the public really wants is a complicated one indeed. That is why, in our opinion, market research in this area should be considered as strictly an art rather than a science. After all even when you use a computer the result depends entirely upon the accuracy of an individual factor. ■

## 2000 MPH Transport?

President Kennedy has asked Congress to provide \$12 million for development of a 2000-mph passenger plane that may be flying by 1970.

Aviation and government experts claim Federal funds for the new plane are necessary because development costs will be too great to permit private manufacturers to develop the supersonic transport. The Federal Aviation Agency would be in charge of the program.





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Beyond that, field men constantly seek out performance data that are used for further product improvements. That's how Rochester turns out a carburetor that performs its job when it's asked to perform, for as long as it's supposed to perform. *Rochester Products Division, General Motors Corporation, Rochester, New York.*



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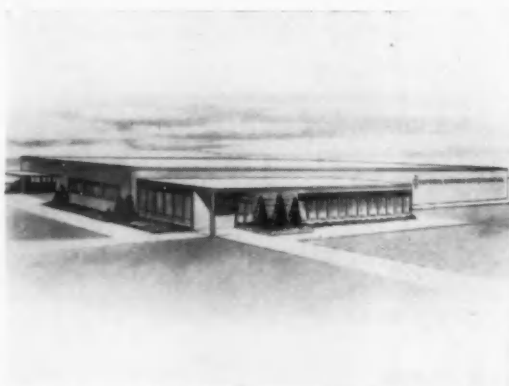
# NEWS

### TRW Acquires German Firm

Thompson Ramo Wooldridge, Inc., has acquired a 50 per cent interest in Teves and Co., of Barsinghausen, West Germany, a subsidiary of Alfred Teves Maschinen und Armaturen-fabrik KG, of Frankfurt, Main, West Germany. The arrangement involved the delivery to Teves of 25,807 shares of Thompson Ramo Wooldridge common stock and the investment of \$3.4 million in cash. The new company will be known as Teves-Thompson and Co., Barsinghausen. It will manufacture automotive accessories and engine parts for the European common market.

### Whiting Corp. Consolidates

Whiting Corp., Harvey, Ill., has consolidated its three foundry products groups and its metallurgical consulting service into a single Metallurgical Equipment Div. G. E. Seavoy, vice president-marketing, said "the new marketing structure will provide better service for our customers and the division will serve the industry in terms of total needs."



Artist's model of plant and office building of Imperial-Eastman Corp. (Canada) Ltd., to be built in Barrie, Ont. The 23,000 sq ft plant will be located on a four-acre site in the Barrie Industrial Park and is scheduled for completion by Sept. 1.

### Press Automation Expands

Press Automation Systems, Inc., Detroit manufacturer of automation equipment for metal-working pressrooms and stamping plants, has purchased a 25,000 sq ft plant at 3840 E. Outer Drive, Detroit. F. J. Sehn, president, said this was the third expansion by the company since it was formed in 1955. Press Automation has completed its move into the new plant and is carrying out manufacturing operations.



## Extra durability of thicker chromium plate now proved by test of time

ACCELERATED corrosion tests such as CASS\* and Corrodokote† consistently show that the thicker the chromium which is plated from M&T processes over a proper nickel undercoat, the more dramatic the increase in resistance to corrosion.

These modern, severe laboratory methods used by automotive engineers quickly evaluate outdoor life expectancy of bright finishes. But how about the test of *time*—would results follow the same pattern?

They have. Results after long, outdoor exposure in Detroit and Kure Beach tell the same story. Thousands of chromium plated steel and zinc die cast sample panels add their weight to the same conclusion: single or duplex deposits of M&T MICRO-CRACK

CHROMIUM, plated thicker than usual specifications, greatly increase durability.

These deposits are produced with SRHS® Chromium Baths—which plate with higher speed than the ordinary chromium bath, and self-regulate themselves for optimum results. SRHS Baths cover complicated shapes more uniformly, reduce problems of plating newly designed parts.

An M&T plating engineer is ready to explain this chromium to you, and recommend your best choice for current production or for 1962 models. Call him in.

\*CASS test: copper-accelerated acetic acid salt spray.

†Corrodokote test: a standard, uniform, highly corrosive slurry is applied on test piece, which is then placed in non-condensing humidity cabinet.



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By C. J. Kelly  
ASSISTANT EDITOR

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ing are all editorial feature ar-  
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A catalog featuring the entire  
line of Cam-Alloy, wrought iron  
and high-test steel sling chains  
contains a section on recently-de-  
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new bell-type magnet assembly. In  
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and tables of specifications for all  
types of slings, the catalog in-  
cludes a glossary of chain terms  
and industry coding symbols pre-  
sented in an easy-to-understand  
form. *Campbell Chain Co.*

### Power Transmission

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thousands of stock parts is shown  
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ment catalog. The literature has  
been published to commemorate the  
75 years of the manufacturer.  
*Browning Mfg. Co.*

### Torque Motors

Torque motors are described in a  
new booklet which contains torque  
speed curves, duty specifications,  
dimensions, and lists a wide range  
of ratings. Illustrations and line  
drawings are shown along with  
outline dimensions. *The Ohio Elec-  
tric Co.*

### Speed Measurement

Bulletin GEZ-3251, 12 pages, de-  
scribes G-E's complete line of ac  
and dc tachometer generators and  
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formation on instruments' applica-  
tions, calibration, accuracy, and  
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surement systems described are  
also included. *General Electric Co.*

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## Load Control 7

Bulletin GET-2916B (revised), four pages, describes load control systems for industrial plants which generate all or a part of their electrical requirements. Systems described in the bulletin include tie-line and frequency control, reactive power control and power limiting control. Schematics and specifications of systems equipment are also included. *General Electric Co.*

## Automatics 8

A comprehensive new job portfolio illustrates, complete with all technical details, efficient metal cutting jobs run on multi-spindle automatics. Edited especially for production men who are alert to the need for better machining methods in the small lot field, this booklet contains a wealth of information on dozens of different workpieces and tooling applications. Each job is illustrated with dimensioned line drawings and complete setup sheet data. *The Warner & Swasey Co.*

## Chuck Actuators 9

A new folder shows chuck actuators in five different sizes, models 2D, 4A, 5B, 6A, and 7A, with capacities to operate power chucks from 4½ to 15 in. in diameter. The large through hole permits converting chucking machines so they can be used for bar work. Collet actuators are listed in four different models: 3B, 25B, 26A and 27A. Model 3B is a double acting air cylinder which is being used extensively on precision boring machines. Models 25B, 26A and 27A are single acting air cylinders with spring return. *Power Grip, Inc.*

## Bending Press 10

New Bulletin 379 provides 12 pages of illustrations, design features, and description of a complete line of Bending Presses that are especially designed for efficient bending of a variety of parts made of tubing, pipe, rod, bar, and certain shaped stock. The principles, advantages, limitations, procedures and types of bends are covered in detail. Numerous examples of typical applications complete with part description and production figures are included. *Pines Engineering Co., Inc.*

## Product Research 11

The DFI Progress Report is a four-page bulletin that details case histories of new developments in industrial design, manufacturing, engineering, and automation equipment. Current articles in The Progress Report cover (1) industrial re-design for a manufacturer of gasoline pumps, (2) automatic assembly machinery for a new type of surgical suture and (3) a case history of steps in the design of a functional, new dental chair. *Designers for Industry, Inc.*

## Silicones 12

A new eight-page two-color catalog describes complete line of silicones and their uses. Designated CDS-129C, the catalog is liberally illustrated with photos and contains data pertaining to the various silicone products, including a complete selector guide for silicone rubber. *General Electric Co.*

## How To Use Teflon 13

Eight page illustrated pamphlet tells how to use Teflon in sheets, rods, tubes, tape and other standard shapes. Describes Teflon's chemical, physical, thermal and electrical properties and tells how to check quality of sheets, rods, tubes and tape. Fabricating techniques using conventional equipment are discussed with recommendations on tools and cutting speeds. Tells how to stamp and form Teflon. Suggested applications and illustrations in 10 general fields are listed, including valve and pump components, gaskets, chemical equipment and mechanical applications as well as non adhesive uses. Other suggestions are offered for use in electrical equipment. *Cadillac Plastic & Chemical Co.*

## Welding Report 14

A new technical report on the metallurgy of electronic welding covers laboratory studies and includes: (a) The resistance welding process. (b) Significant factors in resistance welding. (c) Evaluation of weldability of various materials. (d) Weldability of clad materials. (e) Dissimilar materials. The report is illustrated with photographs of magnified welds, and includes several charts and graphs. *Vacuum Tube Products Div., Hughes Aircraft Co.*

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## High-Temp Laminates 15

A detailed technical data sheet describes Synthane grade AAHT, a new heat resistant laminate. The new material has the general properties of NEMA grade AA plus the ability to withstand elevated temperatures for a long period of time. *Synthane Corp.*

## Testing Machines 16

A new brochure describes a complete line of testing machines. Eight types of machines are discussed with line drawings and specification information. Data on special application units is also covered. *Steel City Testing Machines, Inc.*

## Bolted Assemblies 17

A four-page folder shows production specialists how to take the guesswork out of bolted assemblies, assure maximum clamping force from threaded fasteners, and eliminate bolt failures caused by substandard tightening. The literature outlines the importance of accurate torque/tension relationships to fastener efficiency and explains why torque, in itself, is not a reliable measure of fastener holding power. Illustrations are included in the folder. *Skidmore-Wilhelm Mfg. Co.*

## Carbon and Graphite 18

Carbon and graphite for high temperature applications is the name of a new technical bulletin which describes the unusual properties and the more important and interesting qualities of the various grades of carbon and graphite. It reviews their application in machining molds, dies, crucibles, sintering boats and other items that require resistance to high-temperatures. A special chart lists the various commonly used types and grades, size ranges, and their physical and chemical properties. *Speer Carbon Co.*

## Tool Tips 19

Volume 36, number three, Tool Tips booklet describes various machines, components and methods of production and production equipment, and is devoted to minimizing cost of production. Line drawing and illustrations are included. *Ex-Cell-O Corp.*

## Starters 20

A newly prepared 36-page brochure fully describes a complete line of Bulletin 709 starters. Extensively illustrated, it provides detailed information on the many construction, installation, and inspection features of these new starters. *Allen-Bradley Co.*

## Automatic Machining 21

A catalog illustrates and describes in detail a line of machines developed through years of pioneering in high speed automation. Several applications, discussed in detail, explain how quality standards may be improved and labor costs drastically reduced. *The Globe Tapping Machine Co.*

## Industrial Rubber Line 22

A new 60-page catalog covers hundreds of products in the industrial rubber line. Divided into sections on belting, hose, molded products and rubber specialties, the catalog is designed to provide the maximum in technical information. It features extensive data sections giving detailed information on the products listed. Mechanical rubber products, particularly hose, are given the name of the service for which they are intended, making for easy reference. Another ready-reference is an index prepared so the user can easily find the type of product for his particular service by listing each item under as many subjects and uses as possible. *Cincinnati Rubber Mfg. Co.*

## Equipment Selector 23

Selector data sheet illustrates typical gears and splines, and shows the best processing suggestions, quality can be raised and costs reduced. Also pictured are 26 basic types of gear cutting, grinding and finishing machines, gear checking equipment and gear cutters. *Michigan Tool Co.*

## Leather Packings 24

A new, illustrated brochure and price list describes leather packings for hydraulic and pneumatic applications. Shown are measurements and prices of V and U-packings, cups, flanges, discs and washers. Complete instructions for ordering also are supplied. *Auburn Manufacturing Co.*

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### Drilling Machines 25

Complete descriptions and a specification list are included in a new booklet covering tape controlled turret drilling machines. Illustrations and charts cover pertinent data. The 16-page publication includes four pages of actual installations and case histories of benefits and advantages derived from the installations. *Burgmaster Corp.*

### Turret Lathe 26

Specifications, design highlights and attachments of the number 3 turret lathe are discussed in a new brochure. Illustrations and drawings show the main features of the machine. *Warner & Swasey Co.*

### Metalworking 27

Yoder Product News is the name given a new metalworking publication which provides a handy report on product development and new applications. *The Yoder Co.*

### Automation System 28

Bulletin G2500 explains how drive speeds of machines and processes can be automatically controlled and regulated by simple pneumatic instrumentation. Concise drawings and descriptions show how AIRtrol can be applied to control liquid level, line pressure, process temperature, constant flow, steam pressure and motor loading. *Reliance Electric and Engineering Co.*

### Insulation 29

Thermal insulations for all types of commercial and industrial requirements, in applications ranging from -400 deg F to 3000 deg F, are completely described in a newly revised 64-page catalog, IN-244A. Information on each product consists of an application photo, description, available forms of types, advantages to users, and detailed specification data, including compliance with government specifications and ASTM standards. The type of insulation and its temperature limit are prominently displayed for each product, to facilitate rapid location of pertinent data. Catalog format throughout has been made as uniform as possible. *Johns-Manville Sales Corp.*

### Fittings and Valves 30

A new 20-page catalog crammed with facts and figures on automatic, "Safety-Lock" and regular quick detachable couplers is now available. Tells where each type is best and most economically used in handling air, oil or grease. This file contains full information on the Foster line of chrome sleeve fittings for all types. Shows practical applications of couplers, fittings, hose and 3-way sleeve valves to use with various air-operated tools and fixtures. Also introduces the new "HANDY-Air" industrial blow gun with maximum volume control. *Foster Manufacturing Company, Inc.*

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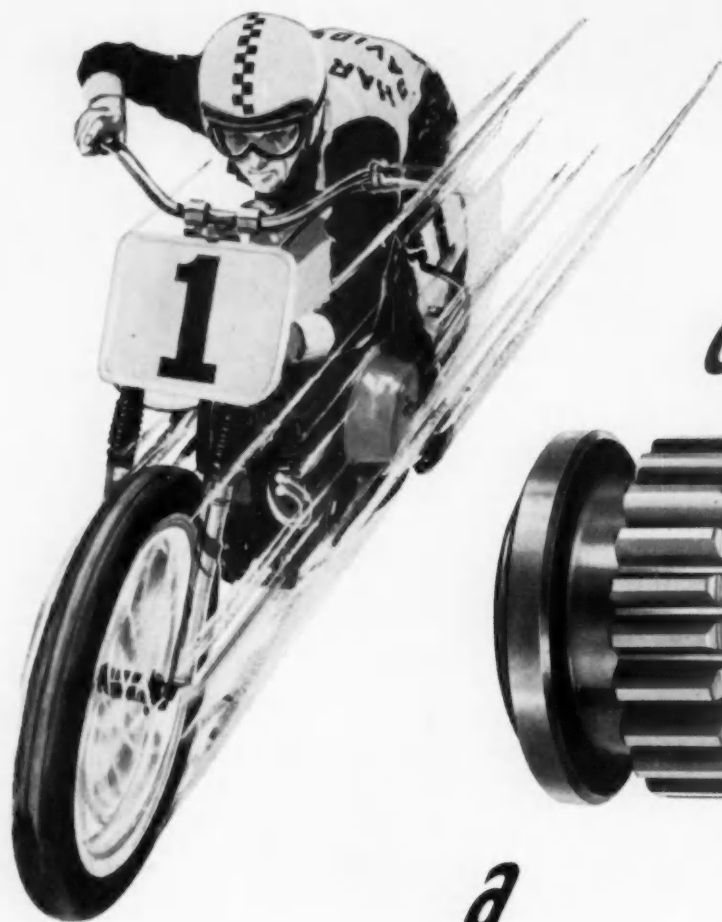
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